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Modern Uses of Logic in Law

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Quarterly Newsletter Published at Yale Law School

Vol. 60D

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MULL is published quarterly (Mar., June, Sept., and Dec.) at Yale Law School. Edited by Layman E. Allen with the advice and assistance of Alan R. Anderson, Mary E. Caldwell, Patricia A. James, Harold D. Lasswell, and Leon Lipson. Send manuscripts to: MULL 401A Yale Station, New Haven, Conn. Subscription rates: $1.50 for single copies, $4 for one year, $10 for three years.

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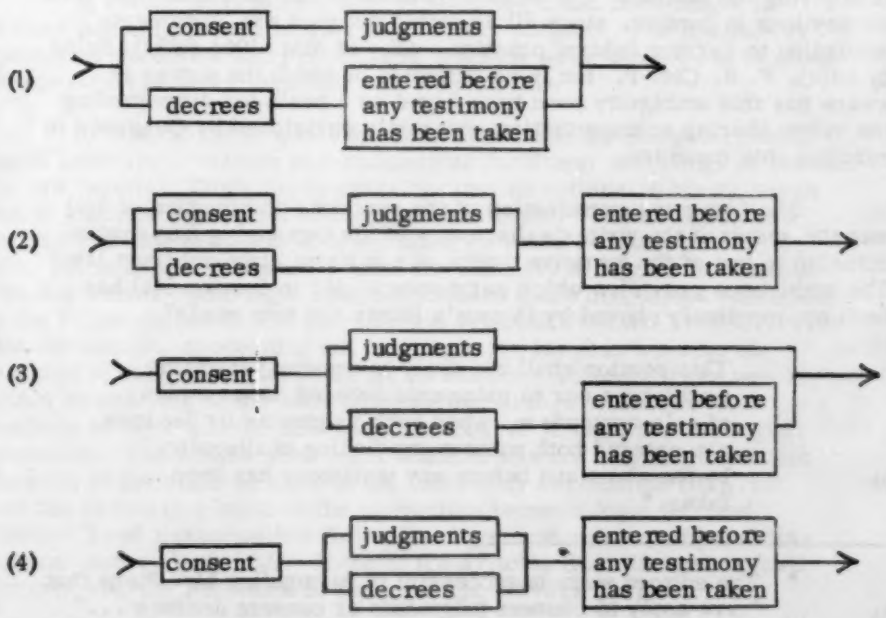
1. APPLICATIONS AND REPORTS ON RESEARCH

1a. SYNTACTIC AMBIGUITY IN CLAYTON ACT, SECTION 5(a)*

The threat of scores of treble damage suits in the wake of the recent federal antitrust prosecutions against bid-rigging in the heavy electrical equipment industry focuses attention on Section 5(a) of the Clayton Act, 15 U.S.C. § 16(a) (1958). This statute provides that civil or criminal judgments won by the United States are prima facie evidence of the defendant's antitrust violation in any subsequent treble damages case against him. An exception is made, however, in order to encourage defendants to enter into consent decrees--". . . [T]his section shall not apply to consent judgments or decrees entered before any testimony has been taken . . . ."

Certain syntactic ambiguities may be discerned in Section 5(a)'s exculpatory proviso, which may be illustrated by using the circuit-diagram method of sentence-analysis (see MULL 60S5a3). Four logical circuits may be constructed for the proviso:



* The views expressed herein do not necessarily reflect those of the government. Publication does not indicate endorsement by the Department of Justice.

Under the first construction, any consent judgment immunizes defendants from the reach of Section 5(a)'s prima facie provisions, even if entered at the close of trial, after the Government had been put to the trouble of litigating the case. Clearly, this construction does not square with the proviso's apparent purpose of encouraging defendants to settle, and thus save the taxpayers the cost of litigation. The first construction also leads to immunization from 5(a) liability when injunctions are issued on motion for summary judgment. Thus, in per se cases like Northern Pac. Ry. v. United States, 356 U.S. 1 (1958), where no testimony was deemed necessary to establish illegality, the obviousness of the violation would, under this construction, bar use of 5(a) by injured victims.

The second construction does not suffer from the first of these infirmities, but it does involve the second. The third construction suffers from the first but not the second infirmity. The fourth circuit illustrates the correct construction of the statute, at least to the extent that the writer can discern the legislative intent.

The syntactic ambiguity in Section 5(a) could readily be cured, were there serious doubt as to the construction the courts would adopt in applying the statute. The words "or decrees" might be omitted without any loss in content, since all equitable decrees are "judgments" according to current federal practice. Cf. 48 Stat. 1064 (1934); Rules 2, 54(a), F. R. Civ. P. But in no litigation of which the writer is aware has this ambiguity even been urged as a basis for disregarding the value-sharing schematization apparently envisioned by Congress in enacting this measure.

The foregoing examination of the syntactic ambiguities of 5(a) was the result of the writer's discovery of his own ambiguous draftsmanship in one of the tentative drafts of a uniform state antitrust law. The ambiguous provision which correspondended to Section 5(a) has been appropriately shaved by Occam's Razor and now reads"

> This section shall not apply to consent judgments or decrees nor to judgments entered under a plea of nolo contendere, when such judgments or decrees are entered both without any finding of illegality by the court and before any testimony has been taken.*

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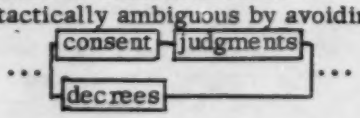
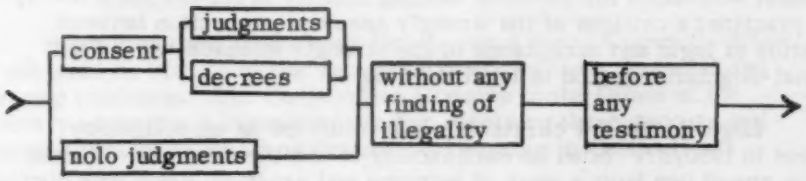
* The editors were unsuccessful in persuading Mr. Stern that " ... apply to consent judgments or consent decrees ..." might be somewhat less syntactically ambiguous by avoiding the possible interpretation:



Circuit:



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Washington, D.C.

1b. RECENT HISTORY OF TEACHING LOGIC TO LAWYERS IN POLAND

In Polish universities until 1954/55 logic had been taught in various humanistic faculties as an auxiliary subject. The law faculty was not an exception and problems of teaching were worked out in close co-operation between logicians and lawyers (R1).

In 1954/55 there was a decision to exclude the obligatory teaching of logic from various non-philosophic faculties, including, of course, the law faculty. Logic for lawyers became an optional subject, which was in practice equivalent to complete exclusion. The curriculum of the study of law in Poland is determined by neither faculty nor university, but is directed centrally from the Ministry of Higher Education. The decision to make logic optional aroused much discussion published in the Polish philosophical journal THE PHILOSOPHICAL THOUGHT. In that discussion, concerning not only logic for lawyers but also the teaching of logic in all faculties as an auxiliary subject, there was included an analysis of the shortcomings and errors of the previous teaching of logic and the necessity of a course in logic for any higher education. The stakes were high, since it was not only the important question of the place of logic in the university curriculum (R2), but also the perplexing topic of the connection between logic (termed "formal") and the so-called dialectical logic and epistemology of dialectical materialism (R3). Some of the articles that discussion dealt directly with the problems of the logic for lawyers (R4).

The chief points of the discussion which are interesting from the lawyer's point of view are: the relation, if any, between the knowledge of elementary logic and the ability to think correctly; the

ways of teaching logic without an excessive formalization and with the greatest adaptation for problem-solving activity in the lawyer's theory and practice; a critique of the wrongly assumed connection between devotion to logic and acceptance of the strongly attacked, so-called formal-dogmatic method in legal thinking.

Logic in the law curriculum was restored as an obligatory course in 1956/57. Now, in each faculty of law the first-year student has to attend one hour a week of lectures and practical exercises during the whole academic year, and has to pass the final examination. The teachers of logic are either professional logicians, or lawyers without any formal degree in logic, or lawyers with academic training in logic, that is, with a philosophical degree. The program of logic for lawyers varies, of course, depending on the teacher, but, roughly speaking, it usually covers some elements of semantics, traditional logic with some essentials of formalized mathematical logic (e.g. from the theory of classes, of sentences, and to a lesser degree, of the calculus of relations) and elementary notions from methodology. There is a strong tendency to illustrate all problems with legal examples and to show the application of logic in all activities in the law area.

REFERENCES

R1 For instance the conference in Warsaw April 4, 1954, see Report in STATE AND LAW 5, 1954, p. 896-899.

R2 E.g., the following papers in PHILOSOPHICAL THOUGHT: T. KOTARBINSKI, "The Crisis of Logic," 1, 1955, p. 223-228; "Forthcoming Decisions about Logical Studies," 2, 1956, p. 121-125; R. SUSZKO, "Whether there are Doubts about Teaching of Logic?" 1, 1955, p. 229-234; K. SZANIAWSKI, " Some Remarks on the not Justified Decision," 1, 1955, p. 235-237; M. PRZELECKI, "Once Again Concerning Logic," 2, 1955, p. 118-121; M. DOBROSIELSKI, "In Connection with the Crisis of Logic," 4, 1955, p. 174-177; A. PODGORECKI, "Errors in the Teaching of Logic," 5/6, 1955, p. 244-256; J. GEDYMIN, "How to Teach Logic," 2, 1956, p. 113-120; K. AJDUKIEWICZ, "Curricula of Logic as Auxiliary Subject," 2, 1956, 126-138.

R3 E.g., H. EILSTEIN, "The Problem of Logic in the Light of the Marxist Theory of Knowledge," PHILOSOPHICAL THOUGHT 5, 1956, p. 124-149; 6, 1956, p. 116-132; J. LADOSZ, "Concerning Logic," idem, 3, 1955, p. 95-109; "About Logical and Dialectical Contradictions," idem, 4, 1956, p. 106-135; A. SCHAFF, "The Marxist Dialectics and the Principle of Contradiction," idem, 4, 1955, p. 143-158.

R4 J. WROBLEWSKI, "Logic for Lawyers," PHILOSOPHICAL THOUGHT 3, 1955 p. 110-116; J. GREGOROWICZ, "Some Remarks about Logic for Lawyers," idem, 4, 1955, p. 171-173.

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1c. MECHANIZED PROCESSING FOR ANNUAL CORPORATION REPORTS IN CONNECTICUT

Institutions and businesses incorporated under Connecticut law are required by statute to file an annual report of their financial and operating condition. The Corporation Division in the Office of the Secretary of the State is responsible for receiving these reports and maintaining records on all corporations operating in Connecticut.

There are some 25,000 corporations reporting annually, and the number increases substantially each year. Manual methods for processing the returns were proving to be quite insufficient. At the request of the Secretary of the State, an administrative survey team from the State Budget Division conducted a complete analysis of the data handling problems of the Corporation Division. The survey resulted in the design of a punched card data processing system which greatly alleviated the problems of that office.*

As is often the case in governmental office operations, certain procedural requirements are established by law. These requirements were the cause for many of the problems under the manual methods and had to be considered in the development of a mechanized procedure.

Reports must be filed between January 1st and March 1st of the year following the reporting year.

Corporations not filing before March 1st are delinquent. Names of delinquent corporations must be furnished to the Attorney General who then collects a penalty fee. The statutes require that, before the Secretary of the State may accept the report of a delinquent corporation, the penalty fee must be paid. If a corporation fails to pay a penalty fee and file the annual report, it leads to the eventual dissolution of the corporation. A fee is required to accompany the annual report. The State retains part of the amount remitted and sends the remainder to the local government of the town in which the corporation's home office is located. A list of "home corporations" must be prepared for each town and supplied to the town clerk along with a copy of the annual report.

---

* There are also approximately 2000 "foreign corporations" registered with the Corporation Division. Foreign corporations are those registered under the laws of another state or nation and doing business in Connecticut. The design of the punched card system included the handling of foreign corporations; however, there are some differences in details. They are not the subject of this article.

Manual Method

Processing activities began with the addressing of the annual report form. Addresses were maintained on metal plates and imprinted by machine onto the form. This semi-mechanical procedure required a month and one-half to complete.

The annual report was a large, two-part form. After being completed and returned by the corporation, one copy was retained by the Secretary of the State and the second (carbon copy) was forwarded to the "home office" town clerk for their files. A portion of the form was designed as a "control slip" which was removed before mailing and filed; it was used to match against returned and completed reports. Control slips which remained unmatched after March 1st represented delinquent corporations.

Removal of the "control slip", folding, and stuffing the reports for mailing occupied the full time of the entire office force.

During January and February the completed reports are received in the Corporation Division. They arrive in heavy volume, and therefore the manual method of processing had to be one in which each phase was completed for all reports before the next phase could begin.

Reports were opened, given a cursory inspection, and arranged alphabetically in batches of fifty. Payment checks accompanying the return were checked for accuracy and signature.

The "control slip" for each return in a batch was pulled from file, and the report, filing fee check, and "control slip" were given the same control number. Checks were then prepared for deposit, and the reports with matching "control slips" were filed for later processing.

Because of the volume of incoming reports, this procedure occupied the full time of the entire work force for these two months.

After March 1st, the final phase of processing began. Reports which had been filed before the deadline were again removed from their temporary file. New and additional information contained on the reports was posted to the reference ledger maintained for each corporation. After all the reports were recorded, the carbon copies were separated, and the original permanently filed. The copies were grouped by town, a list of home corporation names and addresses prepared for each town, and both were then mailed to the town clerk. Meanwhile the State Comptroller was notified as to the amount of money each town was to receive. Town lists of corporations, carbon copies of the annual report, and the State refund usually arrived at the town clerk's office by early autumn.

But the job was not yet complete. During the period that final processing was being performed on properly-filed reports, delinquent returns (after March 1st) continued to arrive. Since the late-filing corporation was subject to a penalty fine the returns were processed for check deposit purposes and then segregated for special handling later on. "Later on" usually meant early autumn.

Delinquent corporations consisted of three groups: those who had filed in this interim period (and who having received no notification to the contrary, often assumed, incorrectly, that they were not delinquent); second, those corporations not reporting at all - probably having ceased operation; and third, those corporations who deliberately or otherwise had simply not filed.

By late summer lists of delinquent corporations were typed and forwarded to the Attorney General. Assessment notices were then mailed. This normally precipitated a storm of phone calls and letters from officials of those organizations which had filed in the interim period.

In all cases, the information contained in the records of the Corporation Division in respect to these delinquent corporations was incomplete for a period of several months (March-August). Approximately two hundred inquiries of all types are received daily from the business and legal public asking for information on corporations. A strong possibility existed that incorrect and misleading information could have been disseminated.

Finally, all the registered corporations were established either as: reporting, delinquent and reporting, or delinquent and not reporting. Action to legislate the latter group out of existance was initiated.

With a breather of perhaps several weeks, the next year's processing would then begin.

Mechanized System

A primary requirement for creating a mechanical data handling system for processing corporation reports was the establishment of both constant and control information in punch cards.

A master name and address card was substituted for the name plate. Punched into the card was the corporate name, an account number, and the town code number of the town in which the corporation's home office was located. A requirement of the system was that the corporation master file be maintained in alphabetical order. Once the punch cards had been created it would have been possible to mechanically sequence the cards by performing an alphabetic sort on the name field

of the card. However, since the average corporation name is fifty characters and since alphabetic sorting is a cumbersome task, alphabetical sequencing could be accomplished more efficiently through the establishment of an alpha/numeric account code.

A basic rule of data processing is: it is easier to work with and control information that is identified by a number. The system requirement (alphabetical sequence) and the data processing requirement were both satisfied by the development of an account code numbering system. An account number consists of five digits preceded by an alphabetic character. The alphabetic character signified the first letter of the corporation's name. Numbers are assigned to correspond to alphabetical sequence, and the same series of numbers are repeated for each letter of the alphabet. After a study of projected growth, a numerical gap in the initial assignment of numbers was determined. This gap allows for expansion in the number of corporations capable of being assigned a number by this system.

The method works as follows:

Account Number	Corporation Name
A 00033	ABC Corporation
A 00066	ADC Corporation
B 00033	BBA Corporation
B 00066	BBB Corporation
C 00033	

These represent initial assignments. If a new corporation were registered, it is assigned the account number which follows the alphabetical sequence and falls at the mid-point between the two existing account number assignments. Thus, if the ACC Corporation were a new registration, it is assigned account number A 00049.

By a quick and easy mechanical sort the cards could now be placed in both numeric and alphabetic sequence.

Another system requirement was that information be supplied to the towns in which the corporation's home office is located. There are 169 towns in Connecticut, and a numbering system following the alphabetical sequence of the towns had been commonly used by State Government Agencies. This same number was punched into the cards.

The corporation report form was revised and redesigned into a punch card. It is a multipurpose card design, i.e., it is used both as a document and a processing vehicle. This fact accounts for the automated and rapid handling which the mechanized system provides.

Just as with the former manual method, processing begins in November of the reporting year. Unlike the old system, it ends before the following May.

Mailing operations begin by reproducing punched information from the master cards into the punch card annual report. The account number and town code in each master card is "read" by machine from the master card and punched into two report forms. At this point there are, then, a single master card and two annual reports having identical punched information. Address information from the master card is then imprinted simultaneously upon the corresponding two annual reports. Machine controls prevent the imprinting of incorrect information. Master cards are then returned to file, and the annual reports are mailed. Two weeks, at most, are required to complete these phases.

Returned and completed reports are received and batched and the money deposited. Periodically batches of returns are forwarded to the State Data Processing Center for machine processing. A batch number is gang punched into the reports for later deposit reconciliation purposes.

Batched reports are tabulated and runoff sheets created indicating batch number, corporation account number, number of cards in the batch, and total dollars. Reconciliation is made to daily deposits, and any errors are corrected. A grand total of the number of reports is obtained to control loss of cards in process.

After the March 1st deadline, returned reports are sorted into account number (alphabetical) sequence. The duplicate return is removed and set aside for the remainder of the processing cycle. Reports are matched mechanically to the master file name and address cards. Matching is controlled on account number, which, you recall, is punched into both cards. Matched master cards represent corporations filing as required; unmatched masters represent delinquent corporations. Unmatched masters are used to create punched card delinquency notices and runoff sheets. This information can be obtained and transmitted to the Attorney General within a few weeks after March 1st. Matched master cards are sorted into town code number sequence. Town lists and remittance amounts are obtained in a tabulating run. The lists and refunds, along with the second copy of the report, are available to the towns within a few weeks. In terms of actual machine time, the entire matching operation is a matter of hours as opposed to the weeks required under the manual methods. Reports are returned to the Corporation

Division for posting and filing. Except for some minor cleanup and followup operations, the entire procedure is completed within one month.

Administrative Effects

An immediate result of mechanizing the system is a substantial dollar savings. Considerably less clerical help is required to perform the operating tasks. Since the mechanical processing is performed by the State Data Processing Center, machine costs are for only actual hours utilized.

But perhaps the greatest benefits are derived from the speed and accuracy of the system, thus freeing administrative time. Greater attention can now be paid to analyzing reports and enforcing adherence to statutory standards. The rapid identification of delinquents reduces the possibility of a corporation continuing to operate while knowingly in default and facing dissolution. Prospective customers and creditors can, by checking with the Corporation Division, be saved the risk of doing business with a potentially insolvent corporation.

Future requirements are also served. The State is moving closer to a complete electronic data processing operation. Information reduced to punched cards is easily converted to tape or disk storage. It is in the foreseeable future that complete name and history information will be maintained in tape storage and almost instantaneous feedback of information will be available.

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Systems Analyst,
RCA Internation Division

ld. BUT HOW DO WE APPLY MODERN LOGIC TO LAW?

The benefits to the legal profession which may arise in one of the fields covered by MULL; i.e. modern methods of information retrieval are quite obvious. By using high speed electronic data processing devices for the handling of great masses of data, the lawyer is relieved from non-legal administrative work and may devote more time for practicing his real profession. The benefits which may arise in the other field to which MULL is devoted; i.e. uses of modern logic, are not so obvious to someone who had no thorough training in modern formal logic, except that even without such thorough training one might indulge in some wishful thinking that through some "logical" means the need for handling masses of data might be reduced in the first place. The lack of basic training in modern logic could of course be made up by a variety of

means. Textbooks, regular college or correspondence courses are already available, though not necessarily easily accessible to every interested person. MULL is undoubtedly in an excellent position to provide constructive guidance in a continued legal education program in modern logic, and to publish practical illustrations of applying methods and principles of abstract logical theory to legal problems of communication. As one type of practical demonstration of the abstract nature of the logical reasoning process and its applicability to subject matters in any field, I would like to offer the following example.

Assume that a guilty verdict is dependent on six relevant events (a, b, c, d, e, and f) as follows:

C1. The occurrence of event a is prerequisite for guilty verdict.

C2. If event f has occurred, then the occurrence of event b or d is also prerequisite for guilty verdict.

C3. If event f has not occurred, then the occurrence of both events c and d is also prerequisite for a guilty verdict.

C4. Notwithstanding the foregoing, the verdict must be not-guilty if both events d and e have occurred.

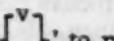
C5. If the verdict is not specified to be not-guilty by one of the four above conditions, then the verdict is guilty.

These five conditions can be represented by diagrams as indicated below, using

1. the lower case letters 'a' through 'f' to represent statements that the respective events have occurred,

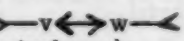
2. the lower case letter 'g' to represent a statement that the verdict is guilty,

3. 'Nv' to represent 'not v' (negation),

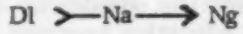
4. '  ' to represent 'If v, then w' (implication),

5. 'v-w' to represent 'v and w' (conjunction),

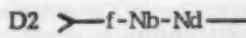
6. ' ' to represent 'v or w' (inclusive disjunction), and

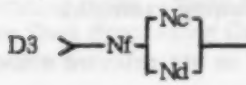
7. '  ' to represent 'v if and only if w' (equivalence).

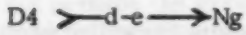
The first condition can be represented by

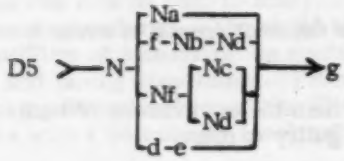


The last four conditions can be represented by

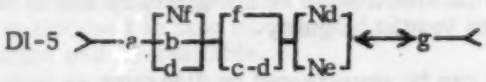








The entire set of five conditions can, in turn, be represented by the following single diagram



Compliance with the conditions may now be traced by starting at the left end and proceeding only through any fact which corresponds to that of a given case. If passages necessary to proceed are open and the g is reached, the verdict is guilty. If at any one stage all passages are closed because the facts of the case do not correspond to the requirements of the condition, then g can not be reached, the proposition is false and the verdict not-guilty.

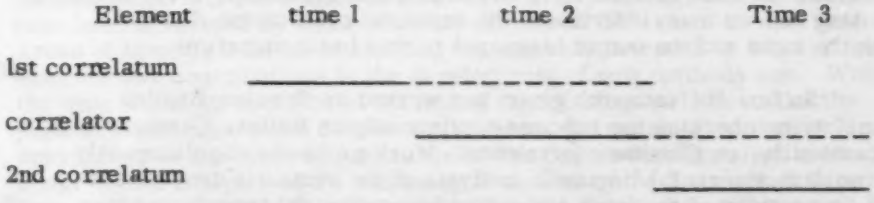
The same result could, of course, have been achieved through "common-sense" argumentation, and it is not claimed that formal logic is necessary for such a simple problem. However, this demonstration is intended to show that formal logic displays the reasoning process in an abstract form, irrespective of meaning and without regard to the language in which the problem is stated, so that the process can then be applied to any analogous situation with different meanings. In the case of more complicated problems, the approach through formal logic may be the only practical one and, consequently, exercises in formal logic beginning with the simpler cases may be very useful.

Nicholas A. Vonneuman
Member of the D.C. Bar

1e. THE MILAN PROJECT OF MECHANICAL TRANSLATION

Since February 1959 under contract with the Research and Development Command of the U.S. Air Force, the Centro di Cibernetica e di Attivita Linguistiche (Institute of Cybernetics and Linguistic Research, Milan University) has been carrying out research on automatic language translation.

Applying the findings of Professor Ceccato's "Italian Operational School", this research group approaches the problem of MT on the basis of the operational analysis of thought.* These analyses, begun some ten years ago, have shown that human thought is characterized by the particular temporal order in which individual particles of contents are linked. The particles thus become elements of a correlational net, each correlation of which links three of them (and can, in turn, become one element of a new correlation). The three elements of a correlation are one correlator and two correlata. The correlations are formed in the following way: The first correlatum is presented at a time 1 and is maintained up to and at time 2; at time 2 the correlating element (or correlator) is presented and maintained up to and at time 3 when the second correlatum is presented.



This correlational structure is the universal characteristic of thinking. It has nothing whatever to do with the different aspects of the contents of thought, such as, the perceptive, representational, emotional, etc., aspects which are particular or individual characteristics.

Given this basic pattern, the semantic connections which link language to the correlations of thought can be isolated. In order to designate one correlation, any language must employ at least five particles of information: three to indicate the particular elements that are put into correlation; one to indicate which of these is used as the

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* For a more complete description of Ceccato's "Operational Analysis of Thought", see Ch. 24, "Classifications, Rules, and Codes of an Operational Grammar for Mechanical Translation," by E. Albani, S. Ceccato, E. Maretti, A. I. Martynova, and T. M. Nikoloyva in INFORMATION RETRIEVAL AND MACHINE TRANSLATION, Part 2 (Ed. by A. Kent, 1960).

correlator (from which it is possible to infer that the other two must be correlata); and a fifth particle of information to indicate the place of one of the two correlata (from which it is possible to infer the place of the other one).

This analysis has brought to light a factor that is common to all languages regardless of their "linguistic" structure. Hence it is a factor that can serve as a basis for the construction of a bridge between languages. Some such bridge is obviously necessary, if - as in translation - we want to pass from one language to another; and such a bridge can be reliable only if it is not an artificial device (like a synthetic language compiled by combining and, thus, improverishing the linguistic structure of two particular languages), but - as in this case - a natural one, i.e. the logical aspect, not of a particular language, but of the very structure of thought which is the basis common to all of them.

A human translator crosses this bridge, automatically and without becoming aware of it, as he understands the input text (in other words, as he automatically reconstructs the correlational net indicated by the input text). In order to construct a translating machine, however, we must become fully aware of the correlational structure of thinking and we must individuate the semantic connections that link both the input and the output languages to this basic structure.

So far, the research group has worked on Russian-English translation, checking the process continuously on Italian, German, and, occasionally, on Chinese equivalents. Work proceeds simultaneously in two directions: (a) linguistic analysis of the semantic conventions and connections of the input and output languages; (b) transformations of the results yielded by linquistic analysis into a program for electronic computers.

In the course of research it has become clear that a considerable part (estimated at 40%) of the information normally used in understanding language is not supplied by language itself, but by the experience, previous knowledge, and common habits of readers or listeners. For the translating machine such extra-linguistic knowledge has to be made accessible by means of a system of classifications. This network of classifications, although somewhat different for different languages (owing to etymological and cultural divergencies), can, however, also be reduced to a common operational basis which underlies the construction of concepts.

Ernst V. Glasersfeld
University of Milano

3. REVIEWS AND ABSTRACTS

3a. QUANTITATIVE ANALYSIS OF JUDICIAL BEHAVIOR, by Glendon A. Schubert

(The Free Press, Glencoe, Illinois, 1959)

In comparison with quantitative studies in other areas of human relations, relatively few attempts have been made to interpret judicial action in quantitative terms. To the extent that such attempts have been made, they remained mutually isolated endeavors until the publication of Schubert's Quantitative Analysis of Judicial Behavior. Schubert's book is the first combined presentation of such endeavors in a comprehensive form (R1). This alone is an important achievement. But the book also introduces new methods of analysis, which have been developed by Schubert. Consequently, the book is not only highly informative in giving a complete account of quantitative research in judicial behavior up to the time of its publication, but it also offers innovations which must be attributed to the author himself.

In presenting various quantitative approaches to the study of judicial behavior, the author is most careful in pointing out what methods have been developed by other students of judicial behavior, to what new areas of investigation he is applying the methods invented by others, and what his own contributions to the development of new methods are. With the understanding that a brief summary cannot adequately describe the various techniques which Schubert discusses, four main quantitative approaches to the study of judicial behavior can be distinguished in his book: (1) An analysis of the summary decisions of the Supreme Court. This analysis is designed to determine how the Court uses different methods of judicial review and what inferences can be drawn from the use of these methods with regard to the actual exercise of the Court's jurisdiction. (2) Bloc analysis. The purpose of bloc analysis is to identify groups of justices which exhibit various degrees of agreement, to examine how cohesive these blocs are and to what extent and under what circumstances they change, and to determine what the implications of these blocs for the decisions are. (3) Game analysis. The purpose of this method is to explore how the justices gain power through association with and disassociation from blocs. (4) Scalogram analysis. This analysis is designed to determine the positions of justices on issues that appear recurrently before the Court and to detect consistencies and inconsistencies in these positions. The author also compares scalogram analysis with content analysis - a method which attempts to establish the dependence of decisions in specified areas on the respective combinations of circumstances in the cases. Although these different quantitative methods are applied by the author primarily to the Supreme Court of the United States, they have a sufficient degree of generality

to be applicable to the study of other tribunals. As a matter of fact, an application of bloc analysis to the Supreme Court of Michigan is included in the book.

With the exception of the obvious connection between bloc analysis and game analysis, no attempt is made by the author to integrate the different quantitative approaches that he presents into a coherent system of analysis. But this feature of the book is an asset rather than a liability. For the proposal of such a coherent system of analysis might be interpreted as an attempt to provide a complete and exhaustive explanation of judicial action in quantitative terms. It would be highly undesirable to create such an impression. To say that the study of some aspects of judicial action can benefit by quantitative interpretation as an enlightening supplement to the traditional methods of analysis is perfectly defensible. To say much more would be presumptuous - at least at the present stage of quantitative research in the field of judicial action - and actually would be a disservice to such research. In view of these considerations, the decision of the author to present the various quantitative approaches to the study of judicial behavior as separate and mutually independent endeavors, without suggesting an all-embracing scheme, is fully in accord with the requirements of necessary caution. Regrettably, similar caution was not exercised by the author in making important assumptions in the application of some of his methods of analysis.

It is understandable, of course, that in the study of human behavior - including the behavior of courts and judges - assumptions have to be made. If it could be demonstrated that a given assumption is the only possible explanation of observed behavior, there would be little debate about the acceptability of the assumption. Furthermore, if a given assumption provides one of several possible explanations of observed behavior, and if this explanation has more empirical support than the other explanations, the given assumption is preferable to the assumptions underlying the other explanations. On the other hand, if several assumptions can be made, each of which yields an explanation with equal empirical support, it is reasonable to give preference to the assumption which those who exhibit the behavior under study profess as the explanation of their conduct. Accordingly Schubert has no proper justification for making the assumption in his game analysis "that the utility which is the aim of the game for Supreme Court justices is POWER" (p. 176). It would be preferable to assume that the "utility" of a justice is the prospect that the legal interpretation which he accepts on the basis of sincere convictions will prevail. Possibly, but not necessarily, the maximization of this prospect might be power. Making this assumption would not change the application of game analysis in the sense in which Schubert uses it. This proposed assumption would have as much empirical support as Schubert's assumption; and it would be more acceptable than Schubert's, because it is probably in accordance with the explanation which the Supreme Court justices themselves

would give.

These considerations also pertain to Schubert's application of scalogram analysis to the search and seizure cases. As already noted, the main purpose of scalogram analysis is to detect consistencies or inconsistencies of the justices on a recurrent issue. This analysis requires, therefore, that in the cases in which the positions of the justices are examined a recurrent issue can be identified. At one point in his scalogram analysis of the search and seizure cases, Schubert combines federal and state cases. In this fashion, he treats these cases in terms of one issue, whereas the Supreme Court itself has explicitly distinguished these cases in terms of two separate issues - namely, the federal exclusionary rule (the Weeks doctrine), which is applicable only to federal cases, and the fair-trial rule (in terms of the "due process" clause of the Fourteenth Amendment), which is applicable only to state cases. Schubert recognizes that reservations about this combination can be expressed. But he also combines with his search and seizure cases (federal and state) wiretapping cases and cases involving evidence obtained by other modern means of communication without the knowledge and the consent of the defendants. The Supreme Court clearly has not considered such cases as search and seizure cases (e.g., the wiretapping cases come under Sec. 605 of the Federal Communications Act). Furthermore, in his state search and seizure cases, Schubert includes cases which the Court actually analogized to involuntary confession cases. To be sure, it would be justifiable to make the assumption that the Court has considered all these cases in terms of one recurrent issue - in spite of the Court's statement that it has decided these cases in terms of several, separate issues - if it could be shown that this assumption yields the only possible explanation of the Court's action or an explanation which has more empirical support than any other explanation. But Schubert's scalogram analysis of the search and seizure cases does not yield such an explanation. Since an assumption in accordance with the Supreme Court's own statement of its position in these cases would provide an explanation that has as much (if not more) empirical support as the explanation that follows from Schubert's assumption (R2), it clearly would be the more justifiable assumption.

In addition to the foregoing reservations about specific applications of Schubert's scalogram analysis, some general methodological problems appear. In spite of the detail and the care with which Schubert establishes the criteria for the construction of the scalogram matrices, some questions regarding ambiguity, arbitrariness, and circularity still can be raised. But the possible defects in that respect are not as serious as the unnecessary and unjustifiable assumptions which have been discussed. It is regrettable that such assumptions impair the important achievement of this book.

Fred Kort
University of Connecticut

REFERENCES

R1 A more concise presentation of the subject matter of the book was given in "The Study of Judicial Decision Making as an Aspect of Political Behavior", by Glendon A. Schubert, American Political Science Review, Vol. LII, No. 4 (December, 1958), pp. 1007-1025.

R2 This can be demonstrated by constructing separate scalograms for the cases, in accordance with the separate issues that have been distinguished by the Supreme Court. Schubert himself constructed such separate scalograms for his federal and state search and seizure cases (Tables 5.7A, B, C, and D in his book), and these scalograms yield higher coefficients of reproducibility - the measure of the degree to which a perfect scale is approached - than the scalogram for the combined federal and state cases (Table 5.7 in the book).

3b. THE USE OF ELECTRONIC COMPUTERS FOR INFORMATION RETRIEVAL IN MEDICO-LEGAL RESEARCH: Address by George Yahn

One of the quartet "Doctor, Lawyer, Merchant, Chief", namely, the lawyer, is pretty far behind his colleagues in realizing the potential uses and applications of electronic computers in his special field. Medical scientists, businessmen, and political and military chiefs have already invested heavily in electronic and other data processing systems. To date, however, the bibliography on the use of computers in the field of law is quite small. One of the areas in which some research is in progress is in the overlap area between law and medicine. In January 1961, Dr. George Yahn* reported on a pilot project in the area of medico-legal research which is being conducted at the University of San Diego, California.

Shortly after Ryan Electronics, Inc. set up an electronics and computer center at the University in 1958, the San Diego County Coroner's Office began programming its departmental records for an electronic data retrieval system with an IBM 650. The information programmed for retrieval includes the coroner's office medico-legal cases, other medico-legal cases, and relevant statutes for the several United States jurisdictions.

The long-range objectives of this program envision the establish-

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* Professor of Jurisprudence, School of Law, University of San Diego, in an address to the Natural Law Society in San Diego.

ment of an information service by which data relative to cases, statutes, and other legal materials could be supplied to lawyers concerned with medico-legal cases anywhere in the United States. Such a service would be patterned after the reservations computer centers of national airlines. By means of a device called an "agent set", reservations agents communicate with the computer center even at great distances. The San Diego plans for distribution of medico-legal data also contemplate dissemination of retrieved information on viewers or TV-like screens in lawyers' or physicians' offices at great distances from the center. Thus, attorneys or physicians who want to know how to find vital statistics, medical facts, and ruling case or statutory law on a medico-legal problem could have the statistical summaries, factual information, case digests and citations given to him in a matter of seconds. According to Professor Yahn's report, it is expected that such a service "would provide a valuable adjunct to clinical and investigative use in the evaluation of diagnostic and therapeutic problems in the medico-legal field, criminalistics, scientific crime detection, law enforcement work, and related fields."

The bases for this application of electronic equipment to medico-legal problems are an efficient communications technology and an equally efficient literature searching system. Professor Yahn's description of the information retrieval process is as follows:

> The first part of the electronic data system is the method of input, that is some way in which both raw information and the rules or instructions to the machine which determine what is to be done with the information can be fed into the system in a form that the system can understand. The storage medium, the second, is the way to preserve information, instructions and results until they are needed. The third part is the performance element, a mechanism to process the information according to the instructions which govern it. The fourth step is the co-ordinating process, which is the monitoring element to be sure that everything happens accurately at the right time and in the right order. The fifth part is the output device, a mechanism that releases the final results in a convenient form for use.

There seems to be no question but that the present state of technology can provide solutions to quick search and rapid transmission of retrieved information. The major difficulty lies in the practical and theoretical problems of "inputs" into such a system. The electronic computers can do only what they are told to do in a language which they can understand. The process of analyzing a data processing problem and establishing a logical pattern for its solution is called programming. A great amount of detailed logical analysis must take place before the

programmer can tell the computer exactly where to find each piece of information, what to do with it and where to put it. Once programmed, the computer will without error perform the same instructions whenever the application is needed.

To date, no one has devised a procedure by which digests of "relevant" facts can be compiled automatically. Professor Yahn emphasizes the fact that there always will have to be some "human element" in determining what are the "important features" of a given case, what are the "concepts" referred to, and what relationships exist between such "features" and "concepts".

In analyzing the data to be put into a computer, the San Diego group uses an "indexing system". Each document of the collection of input documents is checked for subject content, such as the amount of alcohol in the blood at the time of death in an auto accident, anatomic cause of death, results of analyses, unusual incidence findings, etc. Then, each document is characterized by words and phrases usually put in alphabetical array. Another method used is that of classification or cataloging, where items are grouped together into predetermined subdivided areas of specialization. Still another method used is called co-ordination or co-ordinate indexing in which a medico-legal record is analyzed in terms of a number of specific concepts' and with the machine, any one of hundreds of possible concept combinations can be traced. The data include vital statistics, coroner's post mortem records, court decisions, and health statutes. Descriptive labels are affixed to each document, in digital codes or English key words. Then, with any set of concept combinations, searches for data and cases on the issue or point desired can easily be obtained.

"If," says Professor Yahn, "the West Publishing Company's National Reporter System case digests and abstracts of appellate legal opinions with its Key Number system were to be made available to a network chain of computer centers throughout the United States with each center specializing in one aspect of law, or with just one national computer center in the United States, much of the difficulty in having to devise new classification systems for the computers in law would be eleiminated."

The reviewer suspects that whether or not the problem of classifying legal materials for automatic retrieval can be resolved satisfactorily so easily, may be an interesting question for investigation.

Mary E. Caldwell
Yale Law School

5. PROBLEMS

5a. UNIFORM LIVESTOCK CONTRACT, SEC. 4(c)

Section 4(c) of the Uniform Livestock Contract prescribed by the Interstate Commerce Commission reads as follows"

> Before the livestock is removed from the possession of the carrier or mingled with other livestock, the shipper, owner, consignee or agent thereof shall inform in writing the delivering carrier of any visible or manifest injuries to the livestock.

Consider the following situation:

1. A seller shipped a mule to plaintiff buyer (P) on defendant railroad (D).
2. Upon arrival at the destination, the mule was injured.
3. The mule was delivered to P.
4. Prior to delivery, P did not give notice to D of the injury to the mule.
5. The injury was manifest and visible.
6. The mule died the night following delivery.
7. The mule had not been mingled with any other livestock before it died.
8. P filed a claim for damages with D. This was D's first notice of the injury to the mule.

Under what syntactic interpretation of section 4(c) should P collect damages? Under what interpretation should P fail to collect?

6. READERS' LETTERS AND OTHER MISCELLANEOUS ITEMS

6a. GRANT TO UNIVERSITY OF PITTSBURGH HEALTH LAW CENTER

In January, the University of Pittsburgh announced receipt of a grant of $58,886 to assist the Health Law Center of the Graduate School of Public Health to test and refine techniques of automatic retrieval of information in the legal field.

The grant is from the Council on Library Resources, Inc., Washington, D. C., a non-profit organization established to seek solutions to basic library problems and supported by basic grants from the Ford Foundation.

The Council hopes that this grant will encourage other prospective donors to become interested in the problems of electronic storage and retrieval of information in other disciplines as well as law and to make funds available for such research.

The grant to the University of Pittsburgh will enable its Health Law Center, of which John F. Horty is director, to create a tape "library" of statutes large enough to demonstrate the effectiveness of computer retrieval techniques.

The complete statutes of Pennsylvania, New York and New Jersey will form the experimental library. By undertaking identical experimental searches in all three states, the effect on search techniques of the different phrasing of statutory provisions covering the same subjects can be measured.

Searches of the tape "library" will be compared for speed and accuracy with manual searches by traditional methods. The grant will also provide support for the analysis of such experiments and for the further development of retrieval techniques so that they function efficiently for a library of operational size. The University's new IBM 7070 Computer will be used in the research program.

6b. GRANT GIVEN NATIONAL BUREAU OF STANDARDS TO SURVEY INFORMATION SELECTION AND FACSIMILE RETRIEVAL SYSTEMS

A $25,000 grant to the National Bureau of Standards for a survey of the present status of mechanized information selection and facsimile

retrieval systems has been announced by the Council on Library Resources, Inc.

The survey of information selection and retrieval systems will be conducted by the National Bureau of Standards' Data Processing Systems Division and is expected to be completed in nine months.

The Data Processing Systems Division will make an exhaustive survey of the current state of the technology, in particular the status of devices for facsimile retrieval that use photographic media for information storage. It will also examine the factors that determine the latitude available to the users in setting up an information storage, selection and retrieval system where facsimile copies of the selected items are desired as direct outputs.

During the past few years several devices have been proposed which are based upon a combination of an actual copy of the document or item itself, recorded on one or another of various photographic media, and coded information for selecting the material to be retrieved.

In large libraries and files used by many readers the great advantage offered by such a system is that it permits availability of the complete collection at all times. The information which may be stored in such systems is relatively unrestricted as to content. It can include complete documents, abstracts, technical drawings, maps, photographs, and mixed textual and graphic information.

The survey will give special heed to the various degrees of complexity or elaborateness of currently available systems and the possibility of developing less complicated equipment for less sophisticated needs.

The project will complement work already being done by the Bureau's Research Information Center and Advisory Service on Information Processing, which is supported jointly by the National Science Foundation Office of Science Information and by the National Bureau of Standards, and to which at its inception the Council on Library Resources gave financial support.

6c. TO MAKE MULL MORE UNDERSTANDABLE

... After discussing with a couple of professors at UCLA Law School the subject of information and research retrieval and the suggested mechanical devices and proposed procedures and the conference organized by UCLA Law School to this end, what they had to say shed a little light on

the mysteries that we find in looking at MULL. Perhaps the mathematical and other symbol approach which is there made to the problems presented are easily understood by those who are fully conversant with the "language" used. Frankly, it is of little assistance to a law lawyer - and I have taken occasion to throw this at some of our young, highly alert and well trained, lawyers.

In taking the magazine for another year, it is with the hope that you will come up with something that we can understand. Certainly, there must be some approach to the problems of research, and the availability of information required in law practice and in rendering legal service. As I look at modern law books and the indices of today, and witness the continued increase in the number of decided cases, statutory provisions and administrative regulations, the depth of the problem is made more apparent. Certainly, no lawyer can "know" this body of law. Neither can he be sure even of the indices, but must consult in order to find a reference or approach to his problem - in many instances.

More power to MULL if it will help under the circumstances.

Clore Warne
Member of the California Bar

6d. CORRECTIONS

Issue	Page	Line	Correction
59S	4	44	Change "base" to "bases".
60J	71	43	Change "Figure 1" to "Figure 5".
	72	Fig. 6	Change "Define Problem" to "Definition of Problem".
	73	43	Change "4-1 CONCLUSIONS, 4-2 CONCLUSIONS" to "4-1 CONCLUSION, 4-2 CONCLUSION".
60S	93	51-57	Change: "Suppose that one would like to predict how a precedent-following court will decide a future case F where variables X, Y, and Z are present. There is no weighting problem. None of the past cases alone indicates how case F will go. In case

E, the side with the affirmative burden won with W, Y, and Z, but is X in case F equivalent to W? In case D, the affirmative side won with W and Y, but are X and Z in case F equivalent to W?"

to:

"Suppose that one would like to predict how a precedent-following court will decide a future case F1 where variables W, X, and Y are present. There is no weighting problem here because if the affirmative position (for exclusion) won with only variables W and Y present in case D, then the affirmative position will win in case F1 which has variable X in addition to variables W and Y. If future case F2 had only variable W present, there would also be no weighting problem because if the affirmative position lost with both variables W and X present in case C, then the affirmative position will lose in case F2 which has only variable W present. Suppose, however, that future case F3 has variables X, Y, and Z present. Now there is a weighting problem. None of the past cases alone indicates how case F3 will go. In case E, the side with the affirmative burden won with W, Y, and Z, but is X in case F3 equivalent to W? In case D, the affirmative side won with W and Y, but are X and Z in case F3 equivalent to W?"

6e. SYMPOSIUM OF THE PATENT, TRADEMARK, AND COPYRIGHT SECTION

The Patent, Trademark, and Copyright Section of the American Bar Association will present a symposium on information technology at the A.B.A. meetings in St. Louis next summer. The symposium will be held from 2 to 5 P.M., Sunday, August 6, 1961, in the St. Louis Room of the Statler Hilton Hotel. The scheduled speakers and their topics are as follows"

1. Martin Kalikow, Esq., General Electric Co., N.Y., PATENT INFRINGEMENT DETERMINED BY INFORMATION RETRIEVAL

2. Roy Freed, Esq., Philadelphia, Pa., SURVEY OF INFORMATION RETRIEVAL AS APPLIED TO LEGAL CASES AND STATUTES

3. Reed C. Lawlor, Esq., Los Angeles, Calif., ANALYSIS OF PATENT CLAIMS BY MATHEMATICAL LOGIC

4. Don Andrews, Esq., U.S. Patent Office, Director of Office Research and Development, THE APPLICATION OF RANDOM ACCESS TECHNIQUES TO CASE LAW.

6f. ACTIVITIES OF THE EDR COMMITTEE DURING 1960

For about nine years, members of the American Bar Association interested in the application of electronic data processing systems to law have dreamed of the day that the applicability of such systems to law could be actually demonstrated. This dream was fulfilled at the 1960 Annual Convention of the American Bar Association.

IBM made two computers available for the use of the committee to make these demonstrations. Under the leadership of John F. Horty, Director of the Health Law Center of the University of Pittsburgh, automatic legal research in limited fields of law was demonstrated on the IBM-650. Others who contributed to this part of the program were F. Reed Dickerson, Professor of Law at the University of Indiana, and Robert A. Wilson, Vice President of the Southwestern Legal Foundation. Material was also contributed by Lawyers Cooperative and The Bureau of National Affairs. These demonstrations covered hospital law statutes, food product liability decisions, oil and gas law decisions, and decisional and text material relating to hospital law.

Under the leadership of Donald D. Andrews, Director of the Research and Development Division of the United States Patent Office, automatic legal research was also performed on the IBM-305 Ramac. These demonstrations covered decisions in the field of design patent law. The material for these demonstrations was supplied by the Bureau of National Affairs.

The demonstrations were made regularly throughout the convention, a total of about 70 demonstrations being made. These demonstrations were witnessed by approximately 1500 members of the bar. Though automatic legal research with data processing systems has limitations, the advantages were also recognized by members of the bar. A representative of IBM wrote" "The demonstrations served to stimulate many people, not only in the legal profession, but also those in the data processing manufacturing business, into thinking that a whole new area of application of hardware has opened up."

In addition to the demonstrations, the Electronic Data Retrieval Committee sponsored lectures and a panel discussion dealing with the progress that has been made in this field and the problems presented. The principal speakers were:

John F. Horty, Director, Health Law Center, University of Pittsburgh, Pittsburgh, Pa.

Donald D. Andrews, Director, Research and Development, United States Patent Office, Washington, D.C.

Vincent P. Biunno, Member of New Jersey Bar, Newark, N.J.

Vincent Fiordalisi, Professor of Law and Law Librarian, Rutgers University, Newark, N.J.

Allen Kent, Associate Director, Center for Documentation and Communication Research, Western Reserve University, Cleveland, Ohio.

H. Peter Luhn, Advisor, Business Intelligence Systems, Advanced Systems Development Section, IBM, Poughkeepsie, N.Y.

Our committee hopes that its work will help create both a supply of and a demand for the application of electronic data processing systems to legal research. It was greatly encouraged both by the results that were achieved this past year and by the response of members of the bar, manufacturers and publishers.

During the past year, four issues of MULL were published under the direction of Professor Layman E. Allen of Yale Law School. This pamphlet, which was intended originally to be a newsletter for members of the committee, proved to be of such great interest to many others that approximately 450 people have subscribed to it. Our committee hopes that the publication of MULL will be continued under the formal sponsorship of the American Bar Association.

A joint committee was established with the American Association of Law Libraries to study problems of mutual interest.

Our committee hopes that it will be able to sponsor and encourage even more extensive and advanced work in the application of electronic data processing to law during the years to come, and that even as early as next year, more effective demonstrations can be made.

Reed C. Lawlor, Esq.
Chairman, EDR Committee

6g. EDR COMMITTEE PROGRAM IN ST. LOUIS, 1961

A program on NEW DEVELOPMENTS IN RETRIEVAL OF LEGAL INFORMATION will be presented by the Special Committee on Electronic Data Retrieval at the meetings of the A.B.A. in St. Louis next summer. Robert A. Wilson, Chairman of the EDR Program Committee, has announced the following morning and afternoon sessions to be held Tuesday, August 8, 1961, in the Ground Floor Conference Rooms of the Chase Hotel.

Morning Session

9:00- 9:10 OPENING REMARKS AND INTRODUCTIONS
By Reed C. Lawlor, Chairman of the Special Committee on Electronic Data Retrieval, Los Angeles.

9:10- 9:40 SOME FORESEEABLE EFFECTS OF ELECTRONIC LEGAL SEARCH UPON THE ADMINISTRATION OF JUSTICE
By John C. Satterfield, President Elect of the American Bar Association, Yazoo City, Miss.

SEMINARS ON THREE APPROACHES TO COMPUTER LEGAL RESEARCH IN ACTUAL USE
Moderated by Robert A. Wilson, Director of Research, Southwestern Legal Foundation, Dallas, Tex.

9:40- 9:50 INTRODUCTORY STATEMENT
By Mr. Wilson

9:50-10:20 THE "POINT OF LAW" APPROACH
By Robert T. Morgan, Professor of Business Law, Oklahoma State University, Stillwater, Okla.

10:30-11:00 THE "SEMANTIC CODED ABSTRACT" APPROACH
By Jessica S. Melton, Assistant Director for Technical Operations, Western Reserve University Center for Documentation and Communication Research, Cleveland.

11:00-11:30 THE "KEY WORDS IN COMBINATION" APPROACH WITH SOME COMMENTS ON COSTS
By John F. Horty, Director of the University of Pittsburgh Health Law Center, Pittsburgh.

11:30-12:00 PANEL DISCUSSION WITH QUESTIONS FROM THE FLOOR

Afternoon Session

2:00-2:30	HOW ELECTRONIC COMPUTERS WORK: A LAWYER LOOKS INSIDE THE NEW MACHINES By Richard F. C. Hayden, Judge of the Los Angeles Municipal Court and Past Chairman of the EDR Committee	
2:40-3:10	JURIMETRICS AND THE SCIENCE OF PREDICTION IN THE FIELD OF LAW By Lee Loevinger, Assistant U.S. Attorney General, Antitrust Division, Washington, D.C.	
3:30-4:00	SOME USES OF SYMBOLIC LOGIC IN LAW PRACTICE By Layman E. Allen, Professor of Law, Yale Law School, New Haven, Conn.	
4:15-5:00	DEMONSTRATION OF COMPUTER SEARCH, USING THE NEW IBM 1401 IN EXHIBIT AREA ADJOINING THE CONFERENCE ROOMS.	

7. PROCEEDINGS OF THE ELECTRONIC DATA RETRIEVAL COMMITTEE PROGRAM -- AUGUST, 1960

7a. EXPERIENCE WITH THE APPLICATION OF ELECTRONIC DATA PROCESSING SYSTEMS IN GENERAL LAW

I am going to begin by telling you about the Health Law Center at the University of Pittsburgh and specifically about what our activities have been. Thus, I hope to set the stage for you to help explain why we as a research organization were in any way interested in this entire area.

We started with a problem. We did not start with the idea that we would merely begin a project on the electronic retrieval of law. Our primary interest in the Health Law Center is in research, teaching and publishing. Of course, this covers a multitude of sins.

We began in 1956 with a two-year study on the legal aspects of the operation of hospitals, a portion of the general health law. In the course of this study, which involved the full time attention of five or six attorneys, plus some other non-legal personnel, we began to give form to a book, a manual on hospital law, which cut across into many, many areas in connection with the law of the fifty states. In fact, each chapter was organized so that we treated the law of each state with respect to hospitals.

This, of course, involved a considerable amount of research, much of which I had no idea we were going to get into at the time we started the project. I assumed by and large we could treat these problems as general throughout the country -- that they were primarily case problems and that this would be a relatively easy job to do. We felt that this would be a state by state analysis because there would not be much difference between the states.

However, I was sadly mistaken and so was the rest of our staff. We found that much of this material was statutory, and that much of it differed tremendously from state to state. We found that by and large the indexing systems which were available to us and which worked much better in many other areas, tended to give us trouble in the area of hospitals.

I think that the reason for this was because much of the interest in hospital law was of a relatively recent origin. This was witnessed by our efforts as one of the first in the field to really compile a treatise on the subject. Further, there was very little monetary interest on the part of the practicing bar in hospital problems. In fact, as we got into

these studies, we realized that most attorneys, if they had any clients that were hospitals, had just one client -- they were on the board of a hospital and for free they were giving legal advice to their hospital.

This posed a tremendous problem in research because we had to deal with the statutory laws of fifty jurisdictions and, believe me, a hospital has every problem that a business corporation has with respect to its legal organization, its tax questions, and so on. Also, it has all of the other problems that are incipient in the matter of dealing with patients and with medical staffs.

Therefore, you have a body of statutory law which cuts across almost the entire field of law and, further, for every legal problem we found ourselves faced with the necessity of pulling down from the shelves at least a hundred books. We had to pull down fifty index volumes to get to the applicable statute in one specific little area and then we also had to pull down the book in which this statute was located.

I think you all realize from any legal research that you have done, that the number of one hundred is probably very small because there are many occasions in which you don't find the statute where you first look, either in the index or final volume, and this is inherent, I presume, in even the best index systems.

One of the complaints our subscribers have with the hospital manual is that they cannot find material in it, even after two years of our effort to put in formation.

When we finished this research project, we began to turn our attention to other areas of health and treatment, for example, air pollution, stream pollution and the interstate compacts and the intrastate problems dealing with this. We had questions on restaurant control, milk control, and other food control problems. We had questions about the vast area of mental health.

Let me dwell just for a moment on the mental health area because I think this can show the problem that we felt we were faced with.

Mental health takes place in a context of hospitals, but they are not the usual kind of hospitals. They are mental hospitals, by and large. The administration procedures are considerably different and yet have some similarities to those of general hospitals.

Now, this meant that when we began to worry about the administration problems or commitment problems in the mental health hospitals, the same material that we had dealt with with respect to our study was now somewhat different. Twenty to thirty percent, in some cases as much as seventy percent, was exactly the same. It meant going back,

however, in each case, to the original source and doing the same work over again, pulling the material down from the shelf, putting it back up.

I am sure I am not telling most of you anything that you have not already experienced in connection with some other area. What I am trying to do is to point out the problem which exists in large scale legal research and which particularly exists when you are forced to go across state boundaries and try to make an exhaustive survey of the total law on a single subject. But in both of these studies we found that the fatigue factors continually entered into what even the most interested researcher could do.

You know yourself when you prepare a case, you come to a point where you say, "I am too tired to do anything more," and you finish it up or else you say, "Although I have ten more leads here I have put down on paper, it just isn't feasible for me to follow up the nine that are not going to work in order to get the one that may produce something for me."

At this point we began to think of some method of organizing the material in a way that we could get quick access to it and could analyze it in ways we could not do by using manual methods. I will come back to this in a few moments.

We then began talks with the Computation Data Processing Center at the University of Pittsburgh, which had available an IBM 650 computer, a general purpose computer. Up to that time, it was being used for scientific research, for mathematical research, and for programs of business games used by the business school. It was available at the University through the generosity of IBM at a tremendously lower cost than it would have been commercially.

The Computation Center was quite interested in our idea.

We then spent some time with the people at IBM and with the help of Mr. Luhn, whom you are going to hear from later, we obtained a considerable jump in our thinking as to what some of these problems might be and the way in which they might be handled.

We started out in the area of statutory law because it seemed to us, from the problems we had experienced, to be the area where we needed help the most because of the fact that there is not one set of indexes for statutory law.

Just as a little needle that hurt us even further, about midway in our study -- almost at the point where we handed our material to the printer -- the Congress of the United States gave us a boost by providing us with two new states, and we had to include Alaska and Hawaii in

this study. This required us to go back to the books and go through every problem we had as a state-by-state item for two more jurisdictions that, at the time, we had not the faintest notion we were going to put in.

We began with statutes and we reasoned this way: We were dissatisfied to some extent with the indexing system that we had run up against in the health field. One answer might have been for us to have the finest authority in the world on health law come to Pittsburgh and index our health materials, but perhaps we had better have him there full time because the legislature meets every year and they are going to put out more health laws. We would also need an expert on corporate law and health agencies organized into corporations of some sort or another. And we would have needed someone there who was expert on medical law.

We did not have any of these, so we went to the other extreme and we said, "Let's get nothing more than typists and let's somehow try and figure a way that we put the material into the computer absolutely raw, without any indexing whatsoever." That is precisely what we have done in our experiments today.

The illustrations on the following pages (Figs. 1 - 4) will help you to follow the process that we used. By going through these, you may get an idea of our thinking, and perhaps understand some of the problems involved and also some of the techniques which can be used. Of course, this is only one solution.

In Fig. 1, you will see a typical statute which we took directly from the hospital manual. This was the first body of information we used. This is not a hospital statute at all, this is nothing more than a tax statute taken from the tax sections of the codes of the various states. This happens to be Iowa and deals with that section of property which relates to exemptions.

Iowa: Iowa Code Ann. § 427.1 (1948).

§ 427.1 EXEMPTIONS.
The following classes of property shall not be taxed:
* * *
9. PROPERTY OF RELIGIOUS, LITERARY, AND CHARITABLE SOCIETIES.
All grounds and buildings used by literary, scientific, charitable, benevolent, agricultural, and religious institutions and societies solely for their appropriate objects, not exceeding three hundred twenty acres in extent and not leased or otherwise used with a view to pecuniary profit. All deeds or leases by

which such property is held shall be filed for record before the property herein described shall be omitted from the assessment.

10. PERSONAL PROPERTY OF INSTITUTIONS AND STUDENTS.

Moneys and credits belonging exclusively to the institutions named in subsections 7, 8, and 9 and devoted solely to sustaining them, but not exceeding in amount or income the amount prescribed by their charters or articles of incorporation, and the books, papers, pictures, works of art, apparatus, and other personal property belonging to such institutions and used solely for the purposes contemplated in said subsections and the like property of students in such institutions used for their education.

* * *

24. STATEMENT

Every society or organization claiming an exemption under the provisions of either subsection six (6) or subsection nine (9) of this section shall file with the assessor not later than February first (lst) of the year for which such exemption is requested, a statement upon forms to be prescribed by state tax commission, describing the nature of the property upon which such exemption is claimed and setting out in detail any uses and income from such property derived from such rentals, leases or other uses of such property not solely for the appropriate objects of such society or organization. The assessor, in arriving at the valuation of any property of such society or organization, shall take into consideration any uses of the property not for the appropriate objects of the organization and shall assess ...

Fig. 1

We had in the manual fifty-two of these exemption statutes because each state does provide taxation exemptions for charitable agencies.

Word by word, this material was key punched. By key punching I mean that a machine was used which, so far as we lawyers are concerned, was on the order of a typing operation. The girls worked from a keyboard -- merely typing words. The machine translates this typing into punch cards and into the holes on the punch cards which translate the alphabetical system into a numerical system.

This wasn't important as far as I was concerned. What I was interested in was that the job at the outset was a typing job in which I could employ typists as such, and, further, this provided material in typewritten form in the end, in a form that could be reproduced and proofread. We proofread our statutes as they go in in order to eliminate errors, just as you would in any composing job for a brief or otherwise.

This information was put into the machine. Programs were then developed by the Computation Center which worked with this material.

The way they worked with it was this: Looking at Fig. 2, you will see what looks like a list of words. This is just a very small portion of the vocabulary list which is composed by the machine from the total set of documents that went into it. That is, the machine has sorted out and arranged alphabetically words which appear in all of the documents with one exception -- we predetermined a list of common words -- as you can see, a list of thirty, more or less. These words are "of", "and", "the", "offer", and "begin". These were words that we felt were either used so often or so unimportant that we would not want to use them in searching a vocabulary list.

partially	339				
particular	63	151	152	219	294
parties	66	122	399		
partly	368	386	391	412	426
partnership	170	270			
partnerships	66	77			
parts	128	362			

Fig. 2

After each word there are numbers. These numbers represent the numbers of the documents in which these words appear. Therefore, the word "particular" appears in Document 63, Document 151, etc. This enabled us to have a list of vocabulary which not only gave all the words in the total set of vocabulary but also told where they occurred so that if we were to put into the machine "particular", we could get out either the citations or full texts of all the statutes in which the word "particular" was used.

This very simple step is the basis of how we searched the statutes.

Let's go on.

In Fig. 3, you see an inquiry prepared on IBM cards which would be put into computers. This inquiry consists of three parts.

```
$ $01 * $02 * $03 * cite $
$03 portion partly commercial
$02 exemption exempt exempting exemptions
$01 taxation tax taxed taxable taxed tax-free tax-free
```

Fig. 3

Let's read from the bottom of this little sheet of four cards up to the top because they would not ordinarily be in reverse order.

The bottom says, "taxation ... tax ..." and so on. This is a list of words used in an illustrative problem we had dealing with the question of whether charitable hospitals or any charity must list for taxing purposes its properties -- where a portion of the piece of property is being used for charitable purposes and a portion is being used commercially.

Now, in order to find in the machine those states from all fifty jurisdictions which dealt with this problem -- and I can tell you only seventeen of the jurisdictions of the states touched this problem at all in the statutes, although many more touched them in other areas -- we put into the machine all of the words occurring in the vocabulary list which gave the concept of taxation, thus narrowing the problem to a tax problem.

We then put in all of the words which dealt with exemptions in the vocabulary list. This was another set of words on the second line.

Finally, in order to get the idea that this was property which was partly used commercially, we put in another three-part list of words which said "portion" or "partly" or "commercial".

The machine then organized three lists. The first list contained all of those documents in which either the word "taxation" or any of the other words on that first line appeared.

The next list was the one on "exemption" or any words on that list and then, finally, we had the document which had in it the word "portion" or any words on that list.

At this point the machine compared the three lists and our theory of search was that the only documents we wished taken out were documents which contained at least one word from each of the three lists. If it contained two words from list number one and none from list number two, we did not want it out because it may have dealt only with taxation but not with tax exemption. Therefore, the documents which appear on all three lists prepared by the computer are printed out.

Now, we can command the computer to do many things. This is a general purpose computer. It can do many more things than I have described.

One of the things it will do is prepare a list by document numbers. However, this isn't too helpful, since all you have is a list of numbers.

It will also give you citations to statutes, enabling you then to go to the library and look them up.

Further, since we put the full text into the machine, it will print out, word for word, the full text of each of the provisions.

```
split-listing search
$01 = taxation + tax + taxed +
taxable + taxed + tax-free +
taxfree
$02 = exemption + exempt +
exenpting + exemptions
$03 = portion +
partly + commercial
$ = $01 * $02 * $03
cite $
Cal. Const. =s 1c /Supp. 1955/                    329
Conn. Gen. Stat. = s 12-88 /1958/.                339
D.C. Code Ann. =s 47-8018 /1951/.                 343
D.C. Code Ann. =s 47-8018 /1951/.                 344
Hawaii Rev. Laws = s 5151 /1955/1

"Constitution, the "legislature may exempt from taxation all or
any portion of property used exclusively from religious, hospital
or charitable purposes and owned by community chests. Funds,
foundations or corporations organized and operated for religious,
hospital or charitable purposes, not conducted for profit and no
part of the net earnings of which inures to the benefit of any
private shareholder or individual. As used in this section,
..property used exclusively for religious, hospital or charitable
```

Fig. 4

Now, in Fig. 4, you see part of a typical search. In the upper part is listed the material we put in as a question, the same words. In the middle part are listed the citations that are printed out, and finally, at the lower part, portions of the text.

Further, since we put the full text into the machine, it will bring out, word for word, the full text of each of the provisions. You

can see, by looking at the text, it is exactly the text as it would appear in the statutes.

I have very briefly sketched a problem and the portion of a solution to this problem. We are not certain that this is any more than the beginning of the solution. At this point, it seems as if we can be operational in the sense that we can retrieve for our own research purposes either statutes dealing with health law, very broad categories, including tax statutes, including the incorporation codes, county codes, the state government codes or anything else dealing with municipal governments and so on. We can retrieve all these and, thus far, our experience has shown that it will work. We are satisfied enough to say in our further research we will use this system to do our research.

However, this leaves many things unsaid. There are many other ways of doing research and there are many other problems involved in this whole area. Let me very briefly try to indicate a couple to you.

Roughly, what I have said to you involves three general areas. The first is, how do you get the material into the machine. We call this "input". The typing operation is very expensive, but there are other ways.

Secondly, you must consider carefully just what you are going to insert into the machine, since the information in the machine and the searching technique subsequently used are interrelated. For example, if the full text is put into the machine, you may be able to do things you could not if you only put key words into the machine.

Next, once you have the material in the machine, there are many ways in which you may search it. For example, instead of requiring that all three things come out, we may have a list of five or six different subjects -- and only require three out of five or four out of six. This would have had a different effect on the final product.

Finally, there is the question of output -- in what form do you want to receive the material from the machine? Do you want to use a printing operation at very high speed, connected with the machine, or do you want to use one of a myriad of other methods, including photographic reproduction? These are technical problems also involved in the searching operation.

There are many other aspects of the process. One aspect, of course, is the economics question. How much is it going to cost to do this? I can give you a very rough cost figure.

Before I begin, I must make one major differentiation. There

are two costs concerned. One cost is preparing a library and another is using it.

The preparation cost and the use cost must be kept separate. The use cost is going to be constant in the sense you will always have to pay in some way or other to get the material out. The preparation cost can be spread over a small number of your large users at the beginning and, in the end, a very large number of small and large users.

In all of our discussions this morning, I hope we will separate these two concepts.

This is what our experience indicates as to costs in doing the key punching on the Pennsylvania health statutes: We have put in six and a half percent of the statutes. We have not kept overwhelmingly careful track because we are a university and this has been done, as chance would have it, with all kinds of help, key punching as well as secretarial help -- including me. I would say if we were to put in all the health statutes of all the jurisdictions, which would be approximately fifteen percent of the statutory material, we could do it, operating on a nonprofit basis with low overhead and with a lot of the costs hidden, with costs out of pocket of around $60,000. This is nothing more than an educated guess because the question of how much these things cost depends on the size of each section of each state's statutes that must be reproduced.

We counted all the lines in the Pennsylvania group on the theory that it was going to take us so long. I find, after we counted every line, we ended up with about twenty percent of what we were getting in the cards. Therefore, the count was just not accurate for one reason or another. The lines do not jibe with the number of words we get on the card. Also, we put some other information on the cards.

I think one of the important questions that we are discussing here is what can be done, and this is what I am trying to tell you. There are many aspects of how it can be done. And there are many aspects of how it can be used. There are many aspects to the financial picture. I hope that what I am giving you suggests the opportunities that there are for its use.

We have been talking so far about substituting electronic processes for operations which it is feasible to do manually, so as to lower the cost or increase the speed of legal research. But there are other areas in which we have an interest which could never be done manually. These would defy even the most affluent research organization, even a large corporation, except the United States Government.

What I am thinking of is an indexing system that would cut

across every subject in the statute books to search out, for example, a procedural point. In other words, to find out how statutes were enforced and to cut across any type of statute and say, "How do we enforce health statutes?" "How do we enforce antitrust statutes?"

All of this would be for the purpose of comparing, correlating, putting together the provisions, arranging them, getting them out of the machine, looking at them, making some premise, putting another inquiry into the machine and getting out other things. These are the types of projects we can never do by hand because a manual approach would require that before beginning we would have to read practically all the provisions in the code. The machine, however, will do this for us.

I think there are tremendous opportunities for the legal profession to utilize these machines. They are never going to replace books but they are going to open up research fields to the practicing lawyer that we have never even dreamed of.

I hope that the Bar, as well as the universities and the publishing houses, will feel that this is an area which gives the legal profession an opportunity it has never had before to fulfill what I consider the highest portion of a lawyer's training -- the ability to take information, analyze it, and come out with a concept of how a case should be handled or a concept of how legislation should be enacted, rather than spending his time in what is really the task of trying to find pieces of information.

John F. Horty
University of Pittsburgh

7b. EXPERIENCE WITH ELECTRONIC SEARCHING OF UNITED STATES PATENTS

Gentlemen, this coming month marks something of an anniversary for the Patent Office. It is the conclusion of the third year of actual use of a mechanized search system by the examining corps of the Patent Office. I am referring to what we call the steroid search file. This is in the field of chemistry and not law.

It is a tool which the examiner can apply to his problems of locating the prior literature, which includes patents dealing with a specialized subject, namely, steroid chemistry.

This system was started not as a cure-all or as a grand solu-

tion to the Patent Office problem, but for immediate help to the examiners who were sorely stressed in this particular area. It was an area of chemistry which was almost beyond hope for the usual indexing techniques.

The people who conceived this system did not consider it to be very high in the information retrieval field. It was a practical matter. Actually, the system was developed in the space of about three weeks by the people involved. This doesn't mean that their background was only three weeks, but it means the time they applied themselves to the particular problem. The system used and finally adopted required a very short period of preparation.

The field encompassed, at the time, about 1400 chemical patents. Since that time it has grown to about 2400 patents. This gives you some idea of the activity in the particular field selected.

The mechanization was accomplished, not by a key board operation such as Mr. Horty described, but by the technique of using a trained chemist who was interposed between the text of the document and the machine. The purpose was to cut down the bulk of the information found in the prior literature and patents by an editorial operation which would extract from this bulk only the materials pertinent to the purposes at hand.

This is a time-consuming and extremely tedious operation. It is one which requires extremely high accuracy, far beyond what is usual in this particular field.

We were not satisfied with a single analysis of a document and the recording of the information from that document. Instead, the analysis was performed twice by different people. This was to insure that the input to the machine was of a high order of accuracy.

Our costs in this area are surprisingly low. We used examiners who had some training in the particular field but not too much. The costs of this original preparation were in the neighborhood of between five and ten dollars per patent, which was incorporated into the system. This cost is the principal one and far outshadows any of those that are involved in the mechanized handling of the information after it has been extracted from the documents.

After this analysis, of course, punch cards were prepared and used for the actual searching operation. Actually, it took less than five minutes to process this deck of punch cards so that each search was a very quickly established one at a rather low cost.

The results of the use of this system are rather interesting.

We had started out thinking that the results would be solely one of increased speed of operation and hopefully of much less cost. It is true that we do get these advantages but the most important advantage, and one that you cannot buy with money, is the high order of accuracy which flows from a machine operation on data which is carefully prepared.

We were finding from certain tests that we made that we were retrieving on the order of magnitude of twice the pertinent information from the search file as was customarily obtained by the usual manual searching. This resulted from the fact that we were not limited to a localized area of the total file as you would be if you were using a conventional index or a conventional classification system for the materials.

We were quite proud of our classification system in the Patent Office. We have been working on it for a hundred years. However, even in its excellent state, the examiner would only find one-half of the pertinent information.

It is true, of course, that some of this information had a certain amount of redundancy and so we were not as bad off as it would seem. However, we feel that the examiner is only in the position to make the best decision if he has all of the pertinent information in his files.

On matters of speed, it is very difficult to make comparisons. Quality, everyone agrees, is there. Speed is necessarily a comparative quantity.

Unfortunately, in the Patent Office, we did not have the continuity of examiners from the manual system into the mechanized system and so we had no basis to judge what would be the output of the present examiners if they had used the manual techniques only. Each examiner using this system is sold on its operation. He has come to rely on it. He would not want to examine the field of steroids without this system. This, I feel, speaks highly for its accuracy.

Today, we have expanded the steroid operation to persons outside of the Patent Office. For the past three years we have been working in active cooperation with the pharmaceutical manufacturers, who have had the current periodical literature in addition to the patents encoded by the same technique. We now have in our search of files, not only the entire file of patents going back to the first patent in this field, but we also have the last three years of the current literature. This has been gradually accepted by the industry and they are, from what we understand, highly pleased with the operation of this system.

I think I can point to the fact that a mechanized search system

can be worked out so that many people will share in the original cost and even the original equipment required for that system by a similar cooperative effort.

Today, the Patent Office is going forward in different areas, using considerably different techniques. We have graduated into a type of equipment which is much more flexible than the original punch cards, which offers many more possibilities.

We are now using a 305 RAMAC, which is a unique computer in that information is stored not in a magnetic tape but in a system of discs which are magnetically treated so that they also can record information very much like your home recorder can record words and music that is fed into it.

The fact that these are on discs allows the information to be copied from the discs within a very short time. This is something that is not easily done with magnetic tape, which must run from one end to the other in order to locate the particular information sought.

The disc system enables you to use techniques that would be impractical in a magnetic tape system. It makes practical what we call the inverted file. This is a file in which you have the material segregated, not in the form of serial text, but in the form of subject headings, under which you record information which would lead you to those documents having the subject matter of the headings.

The problem that is confronting us in this type of file is one of language. Language is a very important means of communication between people. It is the best we have but it is poor. People will read the same language and get a far different interpretation of it.

If they attempt to cast a thought that they have read, they undoubtedly will use a different set of words. Therefore, when you attempt to make any machine comparisons between a thought that you are seeking or a concept that you are seeking and the actual text or words in a series of documents, you have this language problem since you must convert either the text or the question into some common language. Sometimes this is referred to as a "machine language."

We hope that this conversion can be done by machine. At the present time we are doing it by hand. This is what these people who are analyzing documents are doing -- extracting this pertinent information. Only by the use of such machines can the cost of preparing the input for a search system be kept nominal and contain the high accuracy required.

In the Patent Office we have now produced, in addition to the

steroids, a second search file in the field of organic phosphates. Here we have made use of the RAMAC Computer, not only as the search tool but, to a limited extent, as a tool for preparing data for its own input when it is searching. Much more work, however, has to be done in order to make these costs realistic.

Today, it costs between ten and fifteen dollars to take a phosphate patent and reduce it to a set of cards which can be fed directly into the computers. However, I must repeat that these costs are one-time costs and are not that which is required for the use of the machine. Here again the distribution of these costs to various consumers of the use of the equipment is going to be predicated on the amount of use. In the Patent Office, we are extremely fortunate because we make a great many searches in the field that we have selected for mechanized search.

In the steroid field alone, it has been estimated we have made over ten thousand such searches. Therefore, you can see that the amortization of original costs is relatively easy and painless in the case where you have that volume.

If we were making a few dozen searches, our costs, of course, would be considerably greater. We have figured that we have recovered our costs in connection with the steroid file in possibly three or four months of use. This is because of the high activity within the field of steroids in the Patent Office.

In the field of phosphates we expect to have a similar high use and we also expect to make this search system available to the public. However, we have a handicap, when we are using expensive equipment such as this, in sharing the use of the equipment. In the steroids we could sell decks of punch cards if many industrial concerns had equipment already available to process the cards. However, in the case of RAMAC, there are not nearly as many outside people who have such facilities available. Therefore, it is incumbent upon the Patent Office, we feel, to make our first steps in building up some form of a search center on an experimental basis. We have already done so in the steroid field.

We have circulated this by word of mouth and I think you can recognize why it has to be done this way. According to the rules, the Patent Office does not make searches for people outside of the Patent Office. However, this is purely in research. We are happy to do this, and we have gotten quite favorable responses from a few people who have been informed by word of mouth that this service is available. When the phosphates are fully operational, we certainly expect to have some system of announcing this formally so that other people can use this search system and this equipment, which would be at a nominal cost.

The Patent Office has interested itself in the field of scientific literature because we have had the benefit of study of the problems. Because of this, we felt that we could also demonstrate the use of the information retrieval techniques in fields other than science.

This was done simply by taking the same machine program which is used in our search of the phosphates and replacing the punch cards that were supplied with the phosphates with information from the field of design patents. The program required no change, since the programs underlying retrieval seemed to be common to science as well as the law.

I do not doubt that a person who studied this from the legal end could make improvements which would greatly benefit the legal type of search.

Now, for some of the future of the Patent Office.

Many of our biggest problems, of course, are in the field of science. We have a thousand men who have been working in searching through all of the prior patents and other literature, and there have been some very interesting facts accumulated on the deterioration in the manual search techniques. It was only about thirty years ago that the Patent Office had an output per man of better than 200 patent applications disposed of per year. By disposed of I mean that they were either allowed or went to abandonment because they were anticipated for one reason or another. However, during this thirty years, deterioration has taken place to the point where the examiner today gives out between 80 and 90 such disposals per year. This is not much more than a one-third output.

The examiner today is working not only as hard as he did before, but, in my opinion, he is working harder. The reason for this apparent drop in output is the changing workload that is incurred because of the build-up of the material that must be searched.

In the Patent Office, as in the law, you cannot ignore a bit of information because it has acquired certain maturity. It is still valid for what it represented at the time of its announcement. This, of course, builds up an exceptional curve of materials which must be covered manually. Unfortunately, techniques for classifying large amounts of material defeat themselves because, as you subdivide the total field into more and more groups, you find that the fields of these subdivided groups become more and more closely related and they introduce greater problems in semantics.

Mechanics seem to be the only answer that we have. If the patent system is to continue, and we certainly hope that it will, there

must be some means for reducing this ever-increasing workload. The answer, we feel, cannot be an ever-increasing staff of patent examiners. It must be in the form of some mechanized systems for retrieval.

Donald D. Andrews
U.S. Patent Office

7c. PANEL DISCUSSION: PROGRESS AND PROBLEMS IN THE APPLICATION OF ELECTRONIC DATA PROCESSING SYSTEMS TO LEGAL RESEARCH

Vincent Fiordalisi
Rutgers University

My task is largely descriptive. Its framework is the present state of the research art and some open-ended remarks as to what can be done for the retrieval of legal literature, as it exists and as it may exist if the flood gates are opened. Let me at the outset make four basic assumptions.

1. The practice of law is an intellectual-emotional endeavor of the highest conceptual order, whose major touchstone is the art of relevancy. Open mindedness as to machine possibilities for research should not be construed as a belief that the machines can develop the lawyers' art of relevancy.

2. Much can be done to expand the totality of available literature resources without destroying the carefully developed law search systems now available for operational performance with a limited body of materials.

3. Developments in machine use will have to be on a documentation center concept because the individual operating unit of the legal profession is too small an economic unit to finance the type of documentation centers that have been developed in the industry-supported science areas.

4. The versatility and potentiality of the machines are still at a primitive level. The potentialities of the machines of the future defy our imagination.

For those of us who read and reread cases, and, as the literature on the case develops amend our notes, the lawyers' art of relevancy is no trite phrase. We know our everyday activities are governed

by ideas of the highest conceptual level. We also know that in our theory of judicial decisions, the great truths have been tested and re-tested, in the development of law from case to case -- that our concept of stare decisis justifies our faith in "case matching" as a starting point for research.

Legal research, as used in this context would include as a minimum the task of locating the statutory and decisional law of a political-jurisdictional entity, as it relates to an isolated and marshalled fact pattern, so as to indicate the issues, the law disposition of the issues, and the "squaring" of the body of recorded law knowledge in a predictive synthesis of what duties or sanctions will follow from the isolated marshalled fact pattern.

This level of research is part of the everyday counseling, client opinion writing, memorandum whether persuasive-negotiating, or persuasive-adversary, and in the preparations of the many documents and forms that are part of the everyday work product of the lawyer. At this level of research, the law man is in a hurry and generally satisfied with "case matching" -- perferably from a court in the same jurisdiction, superior to the one that would adjudicate any possible dispute. Let us forget for today's panel the doctrinal, legislative, sociological, factual or basic research, oriented towards change, which has been characterized as the responsibility of other segments of the legal profession.

For "case matching" in the United States we have available a main body of some 2,200,000 opinions of appellate courts. This body increases at the rate of about 25,000 opinions a year. Needless to say, the reported opinions represent a very small fraction of the number of cases litigated and an even smaller fraction of the total law work. The entire body of reported case law is noted with a citation, official or unofficial or both, and is both digested and indexed.

The normal complaints are that the information is not available quickly enough, that the classification scheme does not yield the results expected, that there are too many broad topics which contain some of the most valuable digest paragraphs, that the indexing is not detailed enough, does not cumulate automatically, that the present systems do not discriminate enough for immediate use by the Bar, and the up-dating, as fine as it is, always suffers a substantial time lag.

Despite the complaints, at the practical level of research, the law materials have been brought together, are reported currently, are classified, indexed, and up-dated in information retrieval systems known and used by lawyers, constituting the most highly developed of any known systems available to any profession. Obviously, we are not about to destroy an operative system for a potential system that will cost more and do the same or less. On the contrary, we must continue

the systems we have -- unless they prove incapable of handling the future literature, or become so expensive dollar-wise or time-wise that the machine systems would be more effective and more efficient.

Let me quickly describe the available major search mechanisms. Each of the 25,000 cases every year are listed by name, digested and indexed. The digest results in a series of paragraphs which are classified under some 400-odd topics and some 77,000 key numbers. The same digest paragraphs and key numbers are incorporated into the American Digest System, the regional, and the state digests. The American Digest System includes the 2,200,000 cases with descriptive word indexes of some 2,000,000 word-phrases.

For a lawyer whose sense of relevancy or urgency does not compel him to examine the entire body of case law, he has available a digest of the state case law with the same topic scheme and substantially the same 77,000 key numbers. But in light of the fact that the number of cases is limited, the number of descriptive word-phrase entries in the state case law index is generally limited to some 200,000 items. For the lawyer who is interested in the regional picture, there are regional digests based on the same topic and key number system, and somewhere in the neighborhood of 300,000 descriptive word-phrase entries.

If the law man prefers to work with a synthetic product, in many states he can start with an encyclopedia which includes both the statute and case law of the jurisdiction. These are also provided with word indexes with a very substantial number of entries.

In the absence of authority in the state, references are frequently made from the state materials to the general encyclopedia which is supposed to include every reported American case, Corpus Juris and Corpus Juris Secundum. These are based on some 400-odd topics and have respectively some 388,000 word-phrase entries in Corpus Juris and some 450,000 word-phrase entries in Corpus Juris Secundum. These entries provide a direct reference to the body of the text, which in turn by the simple citation refers to the text of the original authority.

The 931 volumes of statute law and the 29,000-odd laws each year are organized in annotated sets of statutes for individual jurisdictions. Each of these sets include within its compass all of the current statutory law and an over-all index, which in the Wisconsin statute contains over 150,000 entries. These annotated state statutes are generally arranged by subject matter in a familiar pattern for the law man. They are annotated by digest paragraphs which, if fairly numerous, are provided with separate topical analyses, and where they are more numerous, a separate index. A reference to a single

case is usually enough to obtain access to the briefs filed on the appeal.

On the national level, utilizing the same 2,200,000 cases, a second competing system for legal research has been developed using a selective case medium. This system appears in the form of annotations for significant cases. Time does not permit a discussion of the number of index entries but you all know that I am referring to the Annotated Reports, that each of the units in the series is equipped with a separate digest which, in turn, has its own word index.

The American Law Reports, 1st Series, had a four-volume index with over 1,000 pages in each of the volumes. The Annotated Reports have mechanical devices for up-dating the annotations and, of course, tables of cases. This competing search mechanism is complemented by its encyclopedia which has a descriptive fact word index of over four volumes. Obviously, the units are interconnected. This publisher also has available, in a good many states, a local encyclopedia, usually entitled "Jurisprudence," which constitutes a key book to the statutory and case law of the state.

Also available and useful at this level of research is a series, entitled "Words and Phrases," which has collected together definitions of a concrete nature from the operative facts of American case law. It is used in much the same way a dictionary is used.

The other major device in legal research is the evaluator or citator, best known in the form of Shephard's Citations. A quick check of the units available in New York would seem to indicate that there are approximately 14,000 pages of entries, 8 columns to the page and about 75 entries in each column -- roughly 8,000,000 entries. This mechanism enables us to immediately determine (with a lag of about 3 months) the present status or value, in the light of subsequent opinions, of any case or statute in the jurisdiction.

Shephard's Citations does more and is capable of doing a lot more, but I do not think it is necessary to go into details. I am equally sure that it is unnecessary to mention, except for the sake of the record, that there is a Shephard's Citation unit available for each unit of the National Reporter System and for each jurisdictional entity.

Mention should also be made of the index of legal periodicals, the wealth of available textbooks, form books, monographs and treatises, and the mechanical tables incorporated in almost all published law materials. For those appalled by the 22,055 pages of C.F.R., and 9,000 pages of the Federal Register each year, the enterprising book publishers that serve the American Bar have, where it became necessary and economically feasible, prepared sources which cut across the entire body of law and included within the framework of a

particular set all the cases, statutes, administrative regulations, rulings, etc., that affect the subject area.

The Labor Relations Reporter is a comprehensive type service supplemented twice weekly. It has its own digest and classification system. The indexes in this set would seem to run to about 89,000 entries. Similarly, the Food Drug Law Service cuts across a particular subject field. It has an index with approximately 11,500 entries. The Prentice-Hall Federal Tax Service uses some 57,000 index entries in its publication. For current information daily services of limited types are available at a price.

Assumptions two and three may be more effectively communicated by a description of a project of a Committee of the Association of American Law Libraries. It is based on the premise that a vacuum exists in the availability of current foreign law. The committee is undertaking a feasibility study of a documentation center for "current" foreign law.

The project assumes that sooner or later the machines will be able to perform and that the cost factors can be handled. It envisions that (1) microfilm copy of foreign legislation will be prepared at the country of origin and transmitted to the documentation center' (2) an electronic translator such as IBM Mark II will translate the document; (3) an auto-abstract of the document will be prepared; (4) the text of the document in multiple languages will be transmitted to a central storage unit such as the Verac 903; (5) the material after coding will be combined with the printed abstract on cards which contain the microfilm copy of the full text; and (6) the cards will then be transmitted to participating members either on a selected subject interest basis or comprehension coverage library type base.

For either or both of these users, retrieval would involve the use of a sorter and a microfilm reader or reader-printer unit. Rather than lack of imagination the project also envisions remote access to the storage unit via telephone lines and code selector which operate either by digits, grid patterns, or electro-luminescence. Output to the remote access user could be by a hold-image type tube, electronic printer, or microfilm.

Obviously, all of this hardware is not now available and if it does become available it is likely to have an initial cost of several million dollars. Unrealistic? Let's wait and see.

Whether our faith in machine potentiality is sound, only the future can tell, but the time and energy to keep abreast of developments, so as to maximize the value of the developments for the legal profession is our responsibility. We do not know the answers but we cannot afford

to assume that our present systems, as good as they are, will always provide the best of all possible solutions.

Allen Kent
Western Reserve University

During my Army days in World War II, I learned a great deal about the art of "passing the buck," and about the unhappiness experienced by the person who finally found himself "at the end of the buck" and forced to make a decision -- either "yes" or "no". The further away that the eventual decision maker was located from the source of the original problem, the greater was the difficulty in arriving at a sound decision quickly. The primary requirement of the decision-maker who found himself at the "end of the buck" was for accurate, reliable, and complete information pertinent to the problem that he could study in order to increase the probability that his decision would be a sound one.

Whenever a decision must be made, the problem is similar -- that of locating information pertinent to the decision which will throw light on the problem under consideration and lead to a judgment based either wholly or partly on fact or on previous informed opinion.

But where and how to obtain information are significant problems today. Late last year for a talk that I was to present to the American Association for the Advancement of Science, I tried to estimate the amount of recorded knowledge being generated that could have a bearing on some decision that had to be made by someone, somewhere in the world. My conclusion was that during every 60-second period during the day and night -- Saturdays and Sundays included -- an estimated 2,000 pages of books, newspapers, or reports would have been published somewhere in the world, and that if one attempted to keep fully informed of everything going on in the world -- through reading -- one would fall behind an estimated 1,051,200,000 pages for every solid year that would be devoted to reading.

This problem faces industrialists, military planners, scientists, engineers, as well as lawyers in keeping abreast of what is published in their own specialized fields.

In the face of this large-size problem those who find themselves "at the end of the buck," and who need information in order to ensure that they make a reasonable number of well-informed decisions, have resorted to three alternate methods for obtaining information that

They feel they need:

1. They have attempted to be highly selective in their reading, relying on their judgment to select the "one page in a million" that they guess will have the highest probability of containing information of potential future interest.

2. They have attempted to rely on abstracting, indexing, or reporting services that compress the amount of information that must be scanned.

3. They have attempted to develop special information files for individual or organizational use from special points of view.

But these three methods of coping with the increasing literature have their limitations, as follows:

1. Those who try to be highly selective in their reading find themselves losing more and more material because of the unpredictable scatter of material of interest through many publications.

2. Those who rely on abstracting, indexing, and reporting services find themselves facing two problems. First, these services have proliferated tremendously. Second, the coverage of most of these services is far from complete, and it is difficult to decide which ones to use in order to be confident of reasonably complete coverage of a particular field.

3. For those who attempt to develop special information files for their own use, it is also necessary to sacrifice completeness of coverage in most cases because of the potential scatter of pertinent information in a tremendous number of publications. The usual budget limitations for this type of work in all but the largest organizations is an important factor in this regard. Despite these budgetary limitations a considerable amount of money is today being spent on individual information processing activities.

Now, the decisions that are to be made in industry and government often involve very difficult problems, which require questions of considerable complexity to be asked of the available body of recorded knowledge. But, the problem of answering complex questions has been aggravated by the breakdown of traditional library tools in coping effectively with the detailed requirements of individuals in identifying information pertinent to a given problem.

However, there are so many problems of this sort that are of extreme importance to the American economy and defense effort that there has been a strong reaction in this country aimed at providing

specialized information centers, all processing large segments of the literature, many overlapping, from the particular point of view where the shoe pinches at a particular moment. Here are some of them in the fields of science and technology:

The Titanium Information Center
Defense Metals Information Center
Infrared Information Agency
Solid Propellant Information Agency
Prevention of Deterioration Center
Electronic Component Information Center
Chemical-Biological Coordination Center
Cobalt Information Center

Also, there are information centers on the world's literature of: fuel and lubricant additives, nondestructive testing, catalysts, disasters, corrosion, instrumentation, thermophysical properties, deep-sea accidents, chemicals with herbicidal properties, radioisotopes, coffee, bridge hands, stamps.

All this is in addition to the normal indexing and abstracting services that are provided by the various technical societies, such as Chemical Abstracts, Mathematic Abstracts, Review of Metal Literature, Engineering Index, Agronomy Abstracts, American Petroleum Institute, Technical Abstracts, Biological Abstracts, Building Science Abstracts, Ceramic Abstracts (U.S. and also England), Corrosion Abstracts, Corrosion et anti-Corrosion Abstracts, Corrosion Engineers Abstracts, Electrical Engineering Abstracts, Electronics Abstracts, Fuel Abstracts, Iron and Steel Institute Abstracts, Packaging Abstracts, Rubber Abstracts, Resins-Rubbers-Plastics Abstracts, Science Abstracts, Vacuum Abstracts, etc., etc., etc.

Gentlemen, if you conclude from what I have said that the documentation services of this country are in something of a mess, I will agree with you completely.

Now you may ask what all this discussion of literature problems in science has to do with the problems of legal literature. The topic I was assigned to discuss is the Law Library of the Future, and more particularly, the relative advantages and disadvantages of a centralized system, of cooperating regionalized systems, and private systems.

At last year's American Bar Association meeting, an eloquent discussion of the problem of coping with the legal literature was presented by Vincent P. Biunno, then Counsel to Governor Meyner of New Jersey, in which he said:

"With each passing year, we pile up decision on statute on rule on regulation and then construct large and cumbersome digests, compendiums, indexes and other archeological devices which we hope will help us find what we want in the ever-growing mound . . . There is strong suspicion that the mountain of precedents has grown to such size that legal research ordinarily consists of no more than snatching the first bit of relevant material that can be found and then flying by the seat of the pants. Let us not delude ourselves. Our legal system depends on precedent to insure that we have a government of laws and not of men, but in practice we rely more on generalized experience, on the lawyer's 'feel' based on vague personal recollections of precedent, rather than on precedent itself."

This quote, if it presents a true picture of the problem of coping with legal literature, makes the earlier discussion of the scientific literature problem quite to the point, since the two problems are similar in size, character and in complexity. Therefore, perhaps the same tools that have been used successfully with the scientific literature -- the punched cards and the computers -- might be used effectively with the legal literature.

It was this thought that gave us heart at the Center for Documentation and Communication Research, and at the School of Law at Western Reserve University to attempt to apply to the literature of the law the same documentation tools and techniques which have been developed and successfully applied to the literature of metallurgy and allied subject fields. In these fields we are currently operating a mechanized searching service for the American Society for Metals and conducting pilot machine searching activities for the American Diabetes Association and the Communicable Disease Center.

The investigation involved the analysis of the Sales Act of the Uniform Commercial Code and a set of actual cases for which these statutes had been construed. This file was abstracted, and the abstracts were encoded for searching by computer. A detailed paper is being submitted for publication, so that I will not provide details but say only that the demonstration of analysis, coding, and searching of these legal materials appeared to be sufficiently promising that there seems to be no reason why much wider application should not be attempted.

I understand that promising results have also been obtained in other experiments, for example, at the University of Pittsburgh and at the U.S. Patent Office. Also, many lawyers have reported successful applications of punched card equipment in various aspects of legal research. The most recent report has been the paper by Roy N. Freed

in the April, 1960, issue of The Practical Lawyer on "Machine Data Processing Systems for the Trial Lawyer." Other demonstrations had been reported three years ago by the American Bar Foundation in connection with the field of divorce laws.

Looking at these scattered projects and looking back about a decade at the scattered machine searching projects that were cropping up in science and technology at a similar state of development of the machine literature searching field, it occurs to me that we should be in the position to give some sage advice on how to take some short-cuts, so that it won't take a decade for the legal field to put its literature house in order.

Let us first look at the technical side of the job that needs doing.

An information retrieval system for law should provide for a very thorough analysis of the documents that are of probable pertinent interest in a search. This implies first a survey of needs for the various branches of the profession, not as a means of obtaining quantitative data on this matter, but rather in order to provide some solid qualitative support for the capital expenditure that will eventually have to be made.

Then I would suggest that a good sampling of the various types of documents be made and to use these as the basis for setting up a pilot analysis-encoding-searching service. This pilot project would involve:

1. The study of the terminology encountered in the document sample, so that the basis could be provided for a coding and cross reference system that would take into account the inherent meaning of this terminology and help to develop a starting point for the encoding and cross referencing of additional terminology that would be encountered.

2. A thorough analysis of the sample documents to provide detailed abstracts of their contents.

3. The encoding of the detailed abstracts and recording on a machine-searchable medium.

4. The searching of the resulting file on the basis of test questions elicited from the legal profession.

5. An evaluation of the results, and a changing of procedures and codes based on the criticism by the profession, leading to the preparation of operating procedures for a mech-

anized searching service.

But where is the money for such a program to come from? In the scientific field, there are large companies engaged in large-scale research in the subject fields covered by these searching services. The professional societies are also quite literature-oriented, and there is a great deal of government interest which can be converted to financial support for such activities.

In the legal field, the picture is somewhat different. One must look mainly to the foundations and perhaps to the reporting services for financial support. Perhaps my best suggestion might be to have the ABA establish a committee to investigate the matter of financial support. Once the capital investment has been made, I would venture to predict that operating costs could be recovered from fees for individual searches.

Now there is the question of "centralization" of an eventual mechanized service. In the United States, the scientists have tended to shy away from centralization for their literature work -- but only in a relative way. For although there is little sympathy for a single large mechanized information center for science, there certainly is interest in having centers in chemistry, physics, biology, etc. The tendency, if a trend can yet be discerned, is to work toward the creation of a new type of "library" -- a library of encoded information, prepared by the various professional associations, but available for searching, duplication, and distribution anywhere by machine methods, so that centralized exploitation as distinguished from centralized processing of scientific information can take place. Many separately staffed abstracting services for processing and libraries for exploitation would operate, but with coordination on a national scale of processing methods and coverage.

Why can't the same balance be achieved in the legal field? It can. But in order to achieve this end, I believe that the ABA must take the lead and set up a committee that will provide guidance to those who wish to do useful work in this field.

My last task today is to hypothesize the legal information center of the future. Here the task is easy, because I will quote from a paper presented by V. P. Cherenin of the USSR in 1955:

V. P. Cherenin, Certain Problems of Documentation and Mechanization of Information Search, 1955.

". . . All this leads to the thought that the time is not far when a new revolution will occur in the storage and dissemination of data, similar to that which was produced by the

invention of printing. It is difficult to guess how it will occur, nevertheless, by letting our imagination roam, it is possible to visualize the following information service of the future.

". . . All arriving and all existing data, after the necessary editorial processing and suitable exterior styling, are photographed at a considerably reduced scale on photographic film. Instead of large runs, only several copies of such microfilm are produced and are sent to one or several information centers. These centers transmit continuously over many wave lengths all the data available in them at a tremendous sequence frequency of frames of microfilm, reaching, for example, a million per second. The selecting device -- which acts in synchronism with the scanning of the microfilm -- permits the image to fall on the screen depending on the inquiry code used to search the data coinciding with a code representing the contents of the data recorded in the frame.

". . . It is difficult to overestimate the flexibility and effectiveness of such an imaginary method of storing and disseminating data. Undoubtedly such a method or something analogous to it will turn out to be cheaper than the existing methods, when the volume of data will reach a definite limit. It goes without saying that, just as after the appearance of printing the handwritten form of recording still remained in use, the appearance of a similar information service will still find a part of the data stored as before and disseminated in the form presently in existence. Let us remark in conclusion that, in spite of the fact that the information service of the future described above is quite fantastic, all the technical units required for its realization are in existence at the present time and being constantly improved."

I subscribe heartily to this prediction of the future. Wouldn't it be wonderful to have this tool available next time you find yourself "at the end of the buck" and forced to make a decision on a legal question?

H. Peter Luhn
International Business Machines Corporation

Instead of letting you know what the potentialities are, I would like to go back to something a little more simple.

By now, our heads are more or less swimming as to what might be possible in the future. Let's just review and discuss for a moment the nature of these fantastic machines that will eventually solve the problems that are facing us in the law business today.

There is a misconception in the minds of some people as to what these machines really can do. I will admit that some of the many manufacturers of electronic machines have been responsible in the past for over-stating the capabilities of the machines, which resulted in the concept that these machines are thinking machines. They are very far away from being that, however, and I think we all should realize this. They are just tools in the hands of men. If you know how to use a tool, you can make good use of such machines.

Take a chisel and a hammer, two very simple tools. You put them into the hands of the right person and you know the results. It is just the knowledge as to what these tools are capable of doing and applying them accordingly which is important.

Therefore, I would like to review with you the few things that machines can really do. Electronic data processing machines (which is a very big word) are very dumb things. They have a lot of wires, tubes, and transistors which have been put together in a certain way to do just about three or four basic functions.

One of these functions is to tell whether one thing is very much the same as another thing. These things may be little dots on a magnetic tape, or holes in a punch card or in a punch tape. The machine has the capability of recognizing a certain configuration of holes and comparing them with a similar configuration; then it can say that these two are alike or they are not alike. That is one function of the machine.

The next function is that it can add numbers. Actually, it really can add only units, but by some clever mechanism invented, it can do a little better than average mathematics and can do these things quickly. Basically, however, it can add one to one and come up with the obvious result which is two.

It can do one other thing. If it says that two things are alike or not alike, it can account for that and can throw a switch so that you can tell the machine if it finds one certain condition to exist, to store that fact. Then, after that is done, you can tell the machine to do something else.

This is a very rough idea of the basic function of the machine. What I wanted to bring out, however, was that once we know these functions, we can string them together in sequence to perform many more complex jobs. This is done by a process which is called "pro-

gramming." You tell the machine through which steps to go in order to accomplish a certain thing. Of course, it is really the obligation of the human being to figure out how to use these machines.

The next concern is the matter of how to approach the solution of a problem. We are here concerned with the intellectual field. They are expressed by language which is written down and, of course, the machine will not know the difference between law or bookkeeping or what other problems you might want to treat. Therefore, you have to arrange it so that whatever the substitutes for the meanings are, for these physical things, they are being processed in some sensible fashion so that a useful product will result.

Now then, let's address ourselves to a typical problem in this area, like law.

We have certain texts. What can you do with these texts so that you obtain a useful result? It was mentioned by previous speakers that you can record the text in some fashion on tape or on punch cards by having somebody key punch this information. You may then store this information in the machine and have the machine perform certain operations thereon, like sorting out words, recognizing whether two words are the same and accounting for that in a kind of dictionary. By comparing dictionaries of different texts with each other you may come up with an account as to how many words are similar and, in this fashion, recognize the degree of similarity of the vocabularies used by the respective authors.

As far as key punching and preparing the special records is concerned, in the future there will probably be means of overcoming the need for rereading texts for the purpose of machine consumption. As you probably know, in type setting, a machine first punches a tape. After this tape has been introduced into the type casting machine and the type has been cast and printed, you throw the tape away. This was in the past, because we now recognize that this tape represented information actually read by the machine and, therefore, was very precious. Therefore, in connection with this original tape, you have as a by-product the input to a computer system.

In designing a system, you recognize that the important part is the difficult part. Once you have a system which has a logical background to its organization, then a program can be developed which will guide a machine through the various processes that are apparently useful to reform and advance from the original.

Here then, is a very important aspect of this whole machine processing of information -- that is, to transform it in such a way that it becomes useful to a human user, because this is the machine's only

possible function. It can only transform and spread the information out in such a form that it becomes more useful and more accessible to the human than in its original form.

Examples have been given this morning in connection with the sorting out of key words and organizing them into an alphabetical list. This sequence would enable a person to locate a given word in a matter of minutes, rather than a period of days or years if he had to scan the whole text of many laws.

We can provide for other performances by machine. If we recognize groups of words as having a certain quality, we can categorize the group according to the specific quality and then have the machine tell us where similar groups occur in a text.

The most important requisite for even getting started is to have machinery of information at our disposal. You can have this type of information in machinery to perform and you can start today to write a program to get a first set of transformations which may be useful for you.

It has been brought out that in designing and developing systems, the machine can help us analyze the material long before we choose a final format for our retrieval system. This is usually underestimated as a useful operation. I can assure you, however, once you have done this, even on a comparatively modest scale, that a big surprise is coming to you because you realize that you have very incomplete information as to what the body of the text that you are addressing yourself to did actually contain. Therefore, on the basis of such first analysis, you can then much more intelligently and successfully develop a system.

Therefore, while various complex systems have been envisioned here this morning, we do not have to wait until all the fancy equipment will be available or until some big group has really spent years and years developing a complete system. I think there are many cases today where a useful operation can be started immediately and then be built up gradually as time goes on.

I am very much surprised by the progressiveness of the group at Pittsburgh University in just going ahead. I am sure while things are nice now that in many cases they did not know what would face them before they progressed to where they are today. However, this is the only way to make progress. The way to do it is to start. This leaves us with the important lesson of our discussion today -- "Get Started!"

For the remarks of Vincent P. Biunno, Newark, N.J., see MULL 60S-1d99.

Citations to MULL

To keep citations brief, the following system will be used in making citations to MULL. Example: MULL 60M-6c#

60 Volume number -- coincides with year of publication
M Month of publication -- M March S September
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6 Section number
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The first issue of MULL appeared in September 1959.

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3. the uses of quantitative methods for the analysis of legal decision making, and
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